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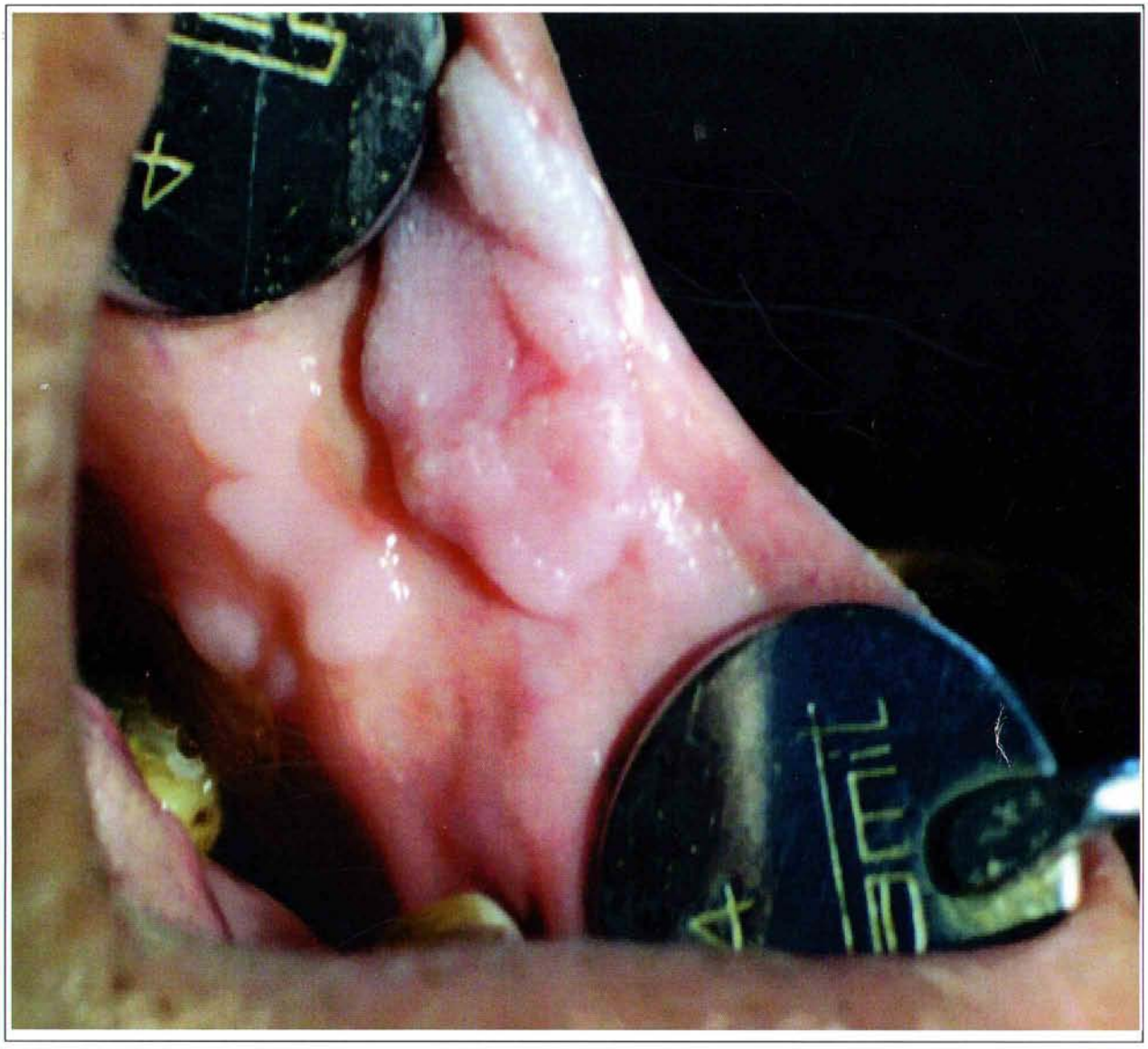

July to December 2014; Volume 1, Issue 2

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Editorial

Digital imaging in routine dental practice

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Digital imaging may be considered as a revolution in radiology that utilizes computer technology and digital receptors for the acquisition, viewing, enhancement, storage and transfer of radiographic images. Technology supporting digital dental radiology began in France in 1984and an article describing direct digital imaging technology was first published in U. S. dental literature in 1989. Since then, digital imaging technology with improvements in sensor design, computer software, hardware packages is being used increasingly in dentistry. Digital Technology can often contribute to improved diagnosis, treatment planning, information storage, retrieval and transfer of data. The technology and its utilization is improving by leaps and bounds with introduction of new products and improvement in soft ware interfaces. However implementation of digital technology requires pre implementation planning with basic knowledge of digital technology and its advances in the market. In the process of digitalisation of dental practice the xray machine may have to be changed to one with lower exposure capabilities for enjoying the benefits of xray dose reduction. Similarly investments may have to be made towards the purchase of a good computer, monitor and printer with adequate facilities for soft ware and hard ware updating. In addition we may have to develop a technique for adequate storage and back up of data on a daily basis with easy retrieval facilities. Provisions should also be made for networking where ever required. The cited primary advantage of xray dose reduction is controversial in the wake of information that the dose in digital receptors are comparable with F-speed films and high speed film screen[rare earth screen] combination. However digital technology indeed helps in eliminating the requirement of a chemical processing facility ; the errors associated with improper processing ; and harmful chemical waste generation. Digital radiography is not without disadvantages. The important disadvantages being high initial cost and rapid technological changes making expensive instruments obsolete . Infection control procedures involving reusable sensors are also challenging.

On evaluating the present scenario the digital technology is here to stay and it is high time that dental surgeons started thinking in terms of digital imaging and its paraphernalia which eventhough expensive, may also be utilized for presenting a modern networked, paperless dental office integrating patient information; medical and dental records, digital radiographs, patient education, entertainment and billing.

References

1. Farman AG, Levato CM, Gane D, Scarfe WC. In practice: how going digital will affect the dental office. J Am Dent Assoc. 2008 Jun;139 Suppl:14S-19S.

2. Williamson GF. Digital Radiography in Dentistry: Moving from Film-based to Digital Imaging. Crest® Oral-B® at dentalcare.com Continuing Education Course, Revised February 14, 2014.

ORIGINAL ARTICLE

Basal Osseo Integrated Implants (BOI)

Koteswara Rao N[1], Rama Mohan K[2], Deepak B[3], Leela Krishna[4], Vijayalaxmi U[5]

Abstract

The purpose of this four years study was to report on the outcomes after using a basal implant design for treating patients especially with poor quality and quantity of bone under immediate load conditions. All patients and their implants were accounted for at the end of the follow-up period.. Even in cases of severebone atrophy, no augmentations were performed. We found a 100% implant survival rate among this consecutive group of patients with varying degrees of bone quality and quantity. All patients received a fixed temporary or permanent bridge within 24 hours after the implant procedure. All patients continued to possess fixed dentures, so the prosthetic outcome is 100%. The clinical application of basal implants is safe and effective and useful in a broad range of indications with immediate loading protocols and without the need for invasive, costly, and time consuming bone augmentation procedures.

Keywords

Basal implants, implant survival, immediate loading, Poor Bone, BOI, Basal Implants

Introduction

Dentists and dental specialists employ considerable clinical skills in an effort to cope with the consequences of partial and/or complete edentulism.these consequences are related mainly to partial or total defects in one or both the jaws 'complement of periodontal ligament .As a result, clinical ingenuity has led to many treatment successes, with prostheses supported by varying degrees of residual periodontium or alveolar bone .The notion for an analogue for a periodontal ligament attachment with predictable long term success, has lead to many experimental studies and many developments in the field of Dental Implants.

The successful outcome of any implant procedure is surely dependent on the interrelationship of the various components of an equation that includes the following (1) Biocompatibility of the implant material (2) Macroscopic and microscopic nature of the implant surface (3) The status of the implant bed in both health (non infected) and morphologic (bone quality) context (4) The surgical technique per se (5) The undisturbed healing phase (6) The subsequent prosthetic design and the loading phase.[1] The growing interest in tooth restorations based on implant procedures has been paralleled not only by changes in the geometry of the implant itself but also in the surgical procedures employed [2]

A lack of physiological forces in fully- or partially edentulous patients often leads to a decrease in the residual alveolar ridge. Dental implants may help to preserve bone due to their positive load-related effects on the jawbone surrounding the implant; hence, appropriate solutions should be explored and discovered to facilitate this process in these challenging patients. The management of poor bone with root form dental implants typically requires additional or augmentative procedures to ensure sufficient stability. Most of the short vertical integrated implants require a long functionless healing period.

With basal implants (BOI®-brand of Dr. Ihde Dental AG, Switzerland) we can avoid augmentation and second reopening, these implants also have immediate loading function and

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implantation can be done simultaneously with the extraction[3]

Materials and Methods

This study was conducted in the department of Oral and Maxillofacial Surgery of Drs.Sudha & Nageswara Rao Siddhartha Institute of Dental Sciences from a period of June 2012 to September 2015, 10 patients were treated. The mean age at the time of surgery was All the patients had Misch and judy C-W to C-H resorption of ridges. After extensive interviews, all patients were considered psychologically fit to undergo the procedure. Informed consent was obtained after explanation of the benefits and risks of the proposed technique. Patients were also informed of the need for frequent follow up visits during the 3-7 day period following the surgery, which was required for the fabrication of the prosthesis .Patients were stressed on the need for proper oral hygiene and peri-implant maintenance.

Implants

BOI ® implants (IDHE ROUP, SWITZERLAND) were used, which are made of commercially pure Grade II titanium. Over a period of 28 months 15 implants were placed of various sizes and discs.

Fig 1 various types of BOI

Prosthetic workup:

All the patients were sent for the impressions immediately after the surgical procedure for the temporary prosthesis. Patients were instructed for a 48hr post-op check up leaving time for the prosthesis fabrication, and temporary crowns were inserted in the first 48-72hr follow up

A CBCT and orthopantamograph were made preoperatively, immediate post op and three months post op orthopantamographs were also made for all the patients. The residual alveolar bone height is measured from the maxillary sinus in the maxilla and mandibular canal in mandible to the highest point of the residual alveolar ridge, is measured and analyzed.

- Intra operative bone height is measured and analyzed.
- Post operative alveolar bone height is measured from the basal disk to the crest of the alveolar bone, it is measured in radiographs using standardized digital measuring software and readings were analyzed.
- The success of the implant is measured in terms of Mobility of the implant , percussion of the implant , alveolar bone height , exudates from the site of implant placement and pain.
- Patient's compliance with the implant and the prosthesis were analyzed in this study.

The development of these implants dates back to the last third of the last century when in 1972 French Dr. Jean-Marc Julliet established this type of the implant. In 1980 Dr. Gerard Scortecci introduced an improved technique to insert this implant; a significant progress has been observed in the medical instruments (cutters and drills). Today, there are several companies which distribute this implant around the world and are involved in its development.

The most well known are Dr.Ihde Dental ,AirPerio and Victory [4,5]

Nomenclature of BOI Implants

Titanium basal implants consist of a cylindrical part and a larger, cortically anchored base plate. Unlike the traditional root-form implants (i.e., screw and blade implants), which are inserted vertically and primarily designed to be supported by trabecular bone, these implants are inserted from the lateral aspect of the host bone providing multicortical support. Hence, are commonly called "disk" or "lateral" or "basal" implants.BOI® implants possess one to three very pronounced "threads" or "base-plates", which are securely anchored in the cortical bone, a bone area which is more stable during the remodeling/ resorption process and which can respond successfully to immediate loading protocols [3].

Implant Head :

The implant head is also the abutment which is incorporated in the implant design. The height of the implant head is always 7.2mm. Implants with small heads are also available which are called as DISKOS®. The head of the implant is sand blasted so as to provide rough surface for the cementation of prosthetic crowns. The head of the implant is also available in the form of THREADED surfaces i.e the prosthetic crown is screwed over the flutes of the implant head these type of implants are called TOI®. The head of the implant can be trimmed to provide wide prosthetic advantages and freedom of construction.[6]

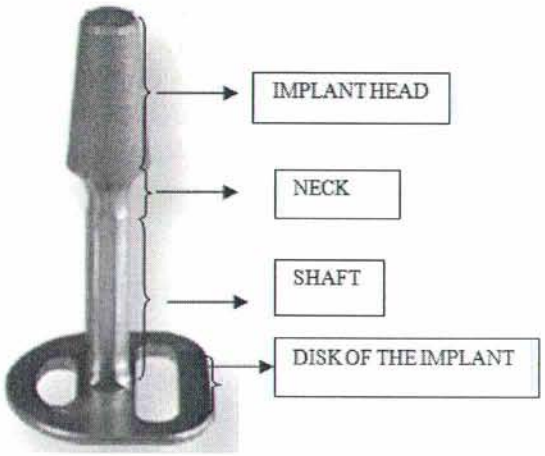

Fig 2 Single Disk BOI Implant

Neck of the Implant :

The neck of the implant connects the head to the shaft thus directing the forces from the head to the disk through the shaft. It is polished and is of diameter 1.8mm. The small diameter of the neck facilitates the implant in bending the head of it creating freedom in prosthesis fabrication. As the neck of the implant is the surface in direct contact with the mucosa it is very critical in carrying the infection and for the spread. As in BOI the neck is thin and smoothly polished it doesn't allow any calculus or any debris to attach to it so preventing infections [4,5]

Shaft of the Implant :

The shaft of the implant connects the neck to the basal disk. The shaft helps in the direction of forces from the head to the basal disk. The height of the shaft is denoted with H in the nomenclature of BOI. The selection of the height of the shaft depends on the available bone there are BOI implants of various heights i.e if the implant is denoted H4 that implies the height of the shaft in that particular implant is 4mm. Likewise BOI implants are available from sizes H4 to H12

Basal Disk :

The most distinguishing feature of the BOI implant is the basal disc. There are single discs, double disc or triple disc implants which are used in various cases from severely atrophied bone to adequate bone levels. The disc of the implant is critical as it undergoes osseointegration with the basal cortical bone thus transferring the forces directly into the cortical bone. The basal disk of the implant is designed in a cuboid form so as to prevent its rotation in the alveolar bone after insertion. There are different diameter basal disks are available measured at the greatest diameter ranging from 7 to 12 mm in diameter. The thickness or the height of the disk ranges from 0.7 - 0.9mm and is denoted with SH.

The implant is named after the number of disks in it. A disk is denoted as B, so number of B's in the name denotes the number of disks in that implant. The basal dicks of implants are of two types 1. Symmetrical denoted with 'S' in the name of the implant 2. Asymmetrical denoted with 'A' in the name of the implant. The symmetrical type of disk contains a symmetrical cubical or a round shape, where the disk is symmetrically distributed around the shaft, in other words the shaft will be in the center of the disc. As the asymmetrical type of implants will not have symmetry in their design i.e the disc is not symmetrically distributed around the shaft.

Various designs of BOI

BS – single disc implant with symmetrical disc shape

BBS – double disc implant with symmetrical disc shape

BBBS – triple disc implant with symmetrical disc shape

BAST – single disc implant with asymmetrical disc shape

Fig 3 types of BOI implants

Implants with Multiple Disks :

It is denoted that in implants with multiple disks the distance between the two discs is of two dimensions and is denoted with SA. The distance between two discs is always 3mm, unless it is denoted with an X in the name of the implant. If an X is denoted in the implant the distance between two disks is 5mm.

BBS – double disc symmetrical implant with distance between two discs 3 mm BBSX – double disc symmetrical implant with distance between two discs 5 mm

In double disk implants there are this type of implants where the basal disk is of higher diameter than the upper disk and in this type of implants,the basal disk is always cuboidal and the upper disk is circular , the diameter of the disk are given the nomenclature of the implant i.e if a BBS implant has a basal disk of diameter 10 and the upper disk has a diameter of 7 it is denoted as BBSX 10/7 [4,6]

Fig 4

Osteotomy cutters:[4]

Osteotomy cutters are used in the preparation of the implant bed for the insertion of the implant, a T shaped implant bed should be made and two types of osteotomy cuts are to be made for the insertion of BOI implants. The instruments used for this are usually designed to cut either the horizontal part or the vertical part of the osteotomy cut. How ever there are instruments designed to cut the vertical and horizontal parts simultaneously.

1.Veritical osteotomy cut made by the vertical cutters

2. Horizontal osteotomy cuts made by the lateral cutters.

Vertical cutters (VC):

A vertical cutter is used to prepare the channel for the threaded pin. At the same time this instrument prepares the ground for the lateral cutters to be used in the next step. The vertical cutters can be used with a turbine and a high speed contra angle hand piece.

Fig 5 vertical cutter

The width of the working surface is 1.6mm, the cut width is thus smaller than the width of the threaded pin, which means that several cutting steps are required. The diameter of the vertical pin is larger than 1.6mm, so the slot has to be widened with the same instrument ,which gives the operator a chance to slightly adjust the position of slot and vertical implant part.

Lateral Cutter (LC)

The lateral cutter is used to create the horizontal dimension of the osteotomy. Several lateral cutters with incremental diameters are used successively starting from 7mm. The largest cutter currently available has a diameter of 15mm.

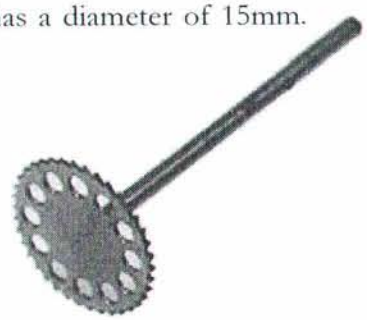

Fig 6 Lateral cutter

Twin cutters are used for double disk implants, their function is twofold, they define the disk to disk distance and also they ensure that both cuts are parallel. Twin cutters are available in two diameters 9 mm and 7mm types which define the inter disk distances 3mm and 5mm

The use of lateral cutters without cutting features along the shaft has the advantage that the horizontal osteotomy can be created more speedily, this presupposes that the preceding vertical cut has been placed properly at right angles with the subsequent horizontal cut. If in cases , a combination cutter can be used to intermediately to create required right angle between the vertical and horizontal slot by refining the vertical slot. The combination cutters are with cutting surfaces on both the disk and the shaft, the cutters are available with disk heights of 0.4mm, 0.6 mm and 0.8mm.[4,6]

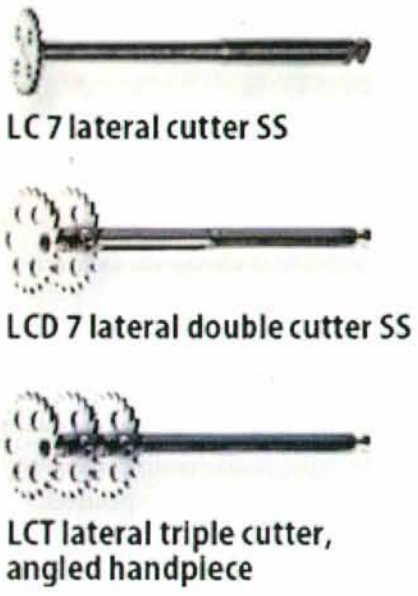

Fig 7 Lateral cutters

Fig 8 Combination cutter

Insertion Chisel :

Once the T shaped osteotomy bed is prepared, the implant is tapped into the socket with a straight chisel by tapping over the implant with it. The tapping should be done being very careful not to damage the vertical polished component of the implant. The chisel should engage the implant at the disk portion.

Fig 9 Insertion Chisel

Surgical Technique

Using homologous cutters that are part of the BOI® system, an implant bed will be prepared under local anesthesia, after creating an appropriate full thickness flap, using meticulously cooled angled hand pieces. BOI® implants must always be inserted bicortically, meaning that the base plate is inserted transosseously (usually approximately horizontal) anchored to both sides of the cortical bone in resorption free, basal bone areas, The implants are then inserted from the lateral aspect with careful tapping action until full bi- or multicortical support is achieved, The presence of sufficient support must be verified visually or manually by testing with the fingers.[7]

The step by step surgical procedure for the implant bed preparation is as follows

Preoperative patient preparation:

-As the implant placement is a minor surgical procedure done under local anesthesia, it does not need patient admission or post op stay in the hospital, preoperative antibiotics are given to the patients so as to prevent any risk of infection[8]

-Patient should be well scrubbed and draped, the isolation of the surgical site should be pristine to maintain sepsis.

- Appropriate analgesics are given either in the IM route or orally in order to reduce the post op pain perception.[4]

Step 1 : all the instruments for the implant procedure should be sterilized along with the lateral

cutters which we use for the implant bed preparation. Once the instruments needed are arranged in the order of usage, patient is given a Inferior alveolar block if in mandible, local infiltration on buccal side and palatal block on the maxilla.

Step 2 : the implant can only be placed after a paracrestal flap has been reflected longitudinally to the jaw, a mucoperiosteal flap is liberally dislodged and well secured to avoid any contact with rotating instruments. There is a distant relationship between the size of the full thickness flap and the level of postoperative pain. The level and duration of the postoperative pain can be reduced by relatively keeping the procedure short and liberal reflection of the flap.[4]

Step 3 : Vertical Osteotomy the first vertical bone cut can be performed with a tungsten carbide cutter to avoid wear of the vertical cutter. A guiding point is given on the vertical surface of the bone, then with use of vertical cuter the vertical cut is made extending till the center of the crest of the alveolar bone [9]. All the preparations are to be made with profuse irrigation of cold saline or cold Ringers Lactate.[4]

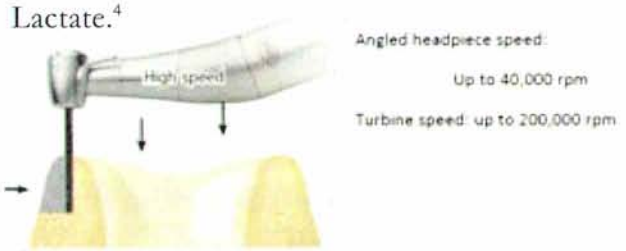

Fig 10 . vertical Osteotomy

Step 4 : Lateral Osteotomy using the vertical cut as the guide the lateral osteotomy cuts are made in a sequence of lateral cutters to reach the desired size cut.

Fig 11 . Lateral Osteotomy

Step 5 : once the T shaped osteotomy is made the implant is tapped slowly into the implant bed with an insertion chisel. Care should be taken not to damage the implant body while tapping; the tapping should always be done with steady taps and only on the disc.

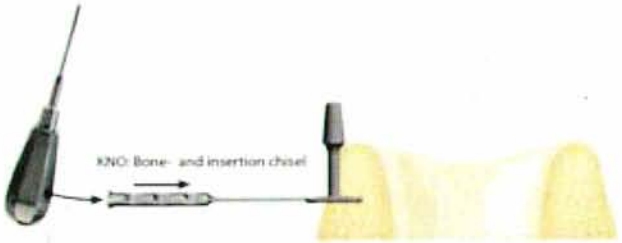

Fig 12 . insertion with chisel

Step 6 : Punch the flap with the scalpel and pull the flap over the abutment, suture the gingival in place with 3'0 vicryl or any resorbable sutures. This step finalizes the implant surgery.

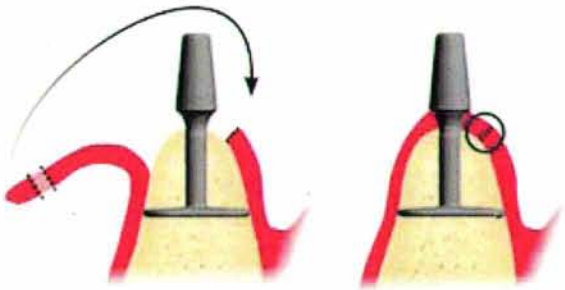

Fig 13 . Suturing the implant

Prosthetic follow up :

- On the same day of the surgery after the insertion of the implant, an impression is made with high quality alginate, for both the jaws and casts are poured.
- Temporary crowns are fabricated on the cast
- On the immediate post op review day the crowns are inserted and cemented with Intermediate Restorative Material
- After 3 months follow up, patient is reviewed checked for implant stability and the temporary crowns are removed
- Impressions are made again and cast is poured out of it.
- Depending the patients choice the permanent crown preparation is done i.e metal ceramic,all metal crowns are made and insertion is done ,adjusted and cemented with GIC.

Implant Selection

The height of the implant is defined as distance from the basal disk to the junction of the neck of the implant with the implant head, which includes the height of the shaft, height of the neck, height of the basal disk, height of the individual disks if present and also the distance between discs in case of implants with multiple discs

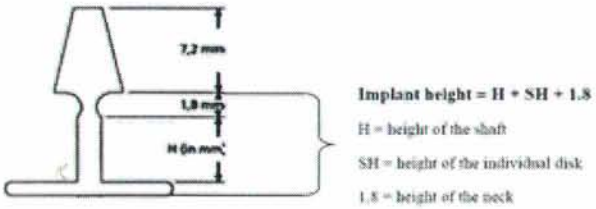

Fig 14 Implant selection for single disc implants

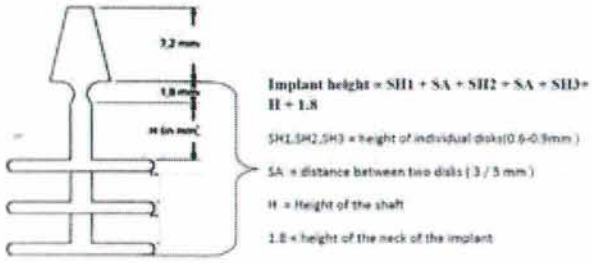

Fig 15 Implant selection for multiple disc implants

The height of the alveolar bone(H) should always be equal to the implant height. Depending on the availability of the residual alveolar bone height the type of implant should be selected. H is also directly proportional to the number of disks in the implant. Width at the basal bone (Wb) decides the diameter of the basal disk,if adequate H is available then multiple disk implants are chosen and Width at the crest (Wc) decides the diameter of the remaining discs. It's always that the Wb is more than Wc , so the basal disk should always be greater or equal in diameters to the remaining disks.

Results

Out of the 10 cases 5 cases (50%) were males and 5 cases (50%) were females. A total of 15 implants were placed in a total of 10 cases (Table I) which were followed up for three months and all the implants were immediately loaded with the prosthesis in 24 -72 hrs of implant placement. None of the patients disappeared or dropped out of the series for any reason. Of the 15 implants, 10 (66.7%) were placed in the upper jaw and 5 (33.3%) were placed in the lower jaw. Of all the implants 12 (80%) were single disk-designs, 3 (20%) were multiple disk-designs (3 disks). 2

Table - 1 (Patient Details)

Patients	Age / sex	Missing teeth	Edentulous space measurement in CBCT (mm)	Number of implants planned according to the Edentulous space
Case 1	43 / F	7645 | 4567	30.6 / 28.9	4 BOI
Case 2	60 / M	| 67	19.6	2 BOI
Case 3	23 / F	76543 |	40	1 BOI , 2 conventional
Case 4	44 / F	7654321 |	44	1 BOI , 1KOS
Case 5	48 / M	7654321 | 12	50	1 BOI 4 KOS
Case 6	38 / F	| 6	9	1 BOI
Case 7	51 / M	6 7 |	19	2 BOI
Case 8	39 / M	16 |	9	1 BOI
Case 9	51 / M	12 | 1234567	48	1 BOI , 4 KOS
Case 10	45 / M	| 1234567	40	1 BOI , 1 KOS

Table II : preoperative and postoperative alveolar bone height

case	H (height in CBCT) in mm	WB (basal disk width) In mm	WC (crestal disk width) In mm	Implants selected	H1 (pre op height digitally measured in OPG) in mm	H2 (post op height digitally measured in OPG) in mm	H3 (3 months post op height digitally measured in OPG) in mm
Case 1	13	7	7	BBBS 7 H 6	14.8	13.99	13.6
	6	7	-	BS 7 H 6	7.02	6.02	5.95
	13.4	7	7	BBBS 7 H 6	14.8	14.55	14.1
	5.4	9	-	BS 9 H 4	7.00	6.30	5.84
Case 2	5.9	9	-	BS 9 H 6	4.61	4.59	4.42
	4.3	10	-	BS 10 H 4	3.70	3.40	3.40
Case 3	15	7	7	BBBS 7 H 6	14.00	13.5	13.1
Case 4	6	7	-	BS 7 H 6	7.40	6.30	6.10
Case 5	5.4	7	-	BS 7 H 6	6.00	5.80	5.00
Case 6	6	9		BS 9 H 6	7.40	6.25	6.00
Case 7	5.9	9	-	BS 9 H 6	4.62	4.45	4.28
	4.3	10	-	BS 10 H 4	3.70	3.40	3.40
Case 8	6	9	-	BS 9 H 6	7.35	6.10	6.00
Case 9	5.6	7	-	Bs 7 H 6	6.00	5.80	5.00
Case 10	6	7	-	Bs 7 H 6	7.40	6.25	6.00

Table III Description of implant mobility and percussion status in follow up periods

case	implant	MOBILITY			PAIN		PERCUSSION SOUND			EXUDATE
		N OP	PO	3M PO	PO	3M PO	IN OP	PO	3MPO	
Case 1	BBBS	NM	NM	NM	P	NP	SR	SR	SR	Absent
	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
	BBBS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 2	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 3	BBBS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 4	BS	M	NM	NM	P	NP	DUL	SR	SR	Absent
Case 5	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 6	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 7	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 8	BS	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 9	Bs	NM	NM	NM	NP	NP	SR	SR	SR	Absent
Case 10	Bs	M	NM	NM	P	NP	DUL	SR	SR	Absent

conventional implants and 10 KOS implants are used in combination with BOI for different patients. No implants have failed during the follow up period giving the overall survival rate of 100%.We did not find any significant influence on the result by patients' gender, upper or lower jaw, implant design i.e. number of base plates, shaft height, bone condition, and BOI used in conjugation with other implant systems but we did find an increasing survival rate during the time in situ. That means that a well balanced implant prosthodontic system which survives the initial bone remodeling phase will have a better prognosis as time goes by with full function. No inflammation causing an implant failure occurred during the observation period. Pain after the healing period was temporally reported by three patients at a single implant site and two patients had mobility of the implant immediately after insertion which had resolved completely by the next follow-up. This mobility of the implant can be attributed to the bone quality, technique sensitivity in implant placement and perception of the patient. This brief mobility it had no significant role in the outcome of the implant treatment. The optimal implant health was assessed clinically on the implant mobility after insertion, pain to the patient, any exudates from the site of implant placement and solid ring sound on percussion[10], the amount of bone resorption compared preoperative and postoperative implant placement should be less than 2mm to consider the optimal health of an implant [11] in Table II and III. Overall every one of all these consecutive patients still has fixed bridges on implants only, giving a prosthetic success rate during the observation period. The mean preoperative alveolar bone height (H1) is 7.72 mm and the mean postoperative bone height at end of the study (H4) which is an average of the bone heights at postoperative follow-up (H2) and 3 months postoperative follow-up (H3) is 6.96 mm and the total mean bone loss is 0.72mm ranging from (0.10 –.27)mm.

Discussion

We found a 100% implant survival rate among a consecutive series of 10 patients receiving 15 BOI® implants and fixed dentures with varying degrees of bone quality and quantity. Even patients who typically may be turned down due to poor bone quality or recommended to receive bone augmentation procedures or smoking or show periodontal involvement are according to our findings, good candidates for basal implants. This is a consecutive study of patients and hence does not represent a convenience sample or selected group.

With basal implants (BOI®-brand of Dr. Ihde Dental AG, Switzerland) we can avoid augmentation procedures and a second surgical procedure. Implantation simultaneously after the extraction and also immediate loading of the implant is possible[4].The innovative design of BOI® hinders the implant rotation in bone during the bone softening by osteoblasts in the remodelling process[4]. The absence of periodontal pretreatment as well as the grade of periodontal disease (100% of the extracted teeth were periodontal involved and infected) found in patients generally contraindicated the immediate use of crestal implants, but with BOI® no higher risk was found. The immediate implant placing in fresh extraction alveoli is the next risk factor; which was handled very well with BOI®.[12]

All current generations of CBCT systems provide useful diagnostic images in accurate imaging and decision making in the implant site selection in regard with the surrounding vital structures along with the bone density.[13]

Use of a high speed turbine (300,000 rpm) to prepare the site for lateral disk insertion does not cause any elevation in temperature harmful to bone. Previous research demonstrated that the maximum temperature during drilling with the pure titanium osteotome was 32°C[9], which is far from the critical temperature of 47°C as the upper limit before irreversible bone tissue injury[14,15]

Histological proof of osseointegration of immediately loaded, laterally inserted, disk-type implants was first obtained in 1985 when a Juillet T3D titanium implant was removed from a patient prior to therapeutic irradiation. Gross examination revealed a healthy sulcus and absence of crater formation around the shaft of this maxillary implant, which had been in function for 9 years. Light microscopy, tetracycline labeling, and micro radiography demonstrated new bone formation at the surface of this titanium implant [16].

Root form endosseous implants generally require > 10mm of vertical bone height for safe placement to achieve primary stability and subsequent osseointegration. Unlike the two-stage surgical technique used to place root-form implants, BOI implants allow for a single surgical procedure with immediate implant loading, even in patients with limited vertical bone supply30. The estimated decrease in cost is ~ 50% [17] compared to treatment protocols requiring augmentations. The decrease in total treatment time can reach up to 98%. Lateral implants are placed in both patients with acceptable and compromised bone.[4]

Basal implants show a more even stress distribution along the vertical implant region than identically shaped implants with a machine-angulated area. Bendable basal implants therefore probably resist masticatory forces better than pre-angulated, machined implants, and unbent implants which provide a thin region in the vertical implant area. For bends up to 13 degrees it was discovered that if there is only one bend, the maximum stress is in the bent area. If two bends are made in two different bending areas, the maximum stresses are distributed between the two and, if either one of the bent areas is machined, there are no residual stresses within the implant body in this area. The maximum stresses are always located near the base-plates[18].

The major difficulty with this technique of BOI concerns training of the surgical and prosthetic teams. The impression for the prosthesis is taken immediately after surgery, which increases chair time. In addition, the dental laboratory must be able to handle their responsibilities within the allotted time. The days required for fabrication of the prosthesis permits its insertion prior to completion of the bone-repair process. The temporary prosthesis must be completed in 24-72 hrs postoperatively[4] because osteoclastic activity increases exponentially from day 10 to approximately day[19].

Locking the implants in place with the prosthesis as soon as possible after surgery thus has both mechanical and biological justification; it guarantees the stability of the implant-supported prosthesis and eliminates the effects of any prosthetic technical inaccuracies before mineralization and osseointegration occur.[16]

The knowledge of BOI from evolution to the surgical outcome emphasizes on the versatility i.e

1) Usefulness in almost all cases regardless of the age, here in our study these implants were given to a patient of age ranging from 23 – 60 years.
2) in cases of severe atrophy of the alveolar bone , in our study the implant was success in atrophied ridges measuring from 4.3mm – 15mm,this was possible due to the design and availability of implants in different sizes, different heights and of all multiple disks.
3) The surgical procedure can be easily mastered yet planning and selection of the implant plays a crucial role in the implant success.
4) Outcome of BOI implant adapts well when used with the other implant systems, here in our study we have used conventional implants, KOS implants along with BOI, where BOI implant was treated as a single entity with immediate loading and other implants are incorporated in the prosthetic design at the end of the study.
5) As the insertion of BOI is a minor surgical procedure with minimal trauma and blood loss, it can be indicated in the patients with systemic diseases in whom minor surgical procedures are not contraindicated. This opens a new window in treating patients with systemic diseases.
6) The bendability of the neck of the BOI implant gives large prosthetic freedom for the practitioners in planning the prosthesis.
7) The factors like single surgical procedure, no need for second surgery, , no need for augmentation procedures and immediate loading makes BOI implants the choice of both the patient and the surgeon

Conclusion

Immediate loading of laterally inserted BOI implants with a fixed, functional prosthesis is a safe and reliable method for management of the partially / completely edentulous maxilla / mandible. The initial bi cortical anchorage achieved with these implants ensures sufficient stability for osseointegration; the lateral insertion technique makes them suitable for seating in atrophic jaws. The standard procedure for placing basal implants includes one surgery followed by immediate loading, thus reducing time, cost, and stress to the patient. With the emphasis on lateral rather than vertical placement, preimplantological bone

augmentation was never necessary. Estimated decrease in cost, treatment time is ~ 50%. There is no hospital admission needed, no time period without proper masticatory function, no second surgery , these implants can be given to smokers and patients with systemic conditions where minor oral surgical procedures are not contraindicated with great deal of success . Also, described in the literature, the use of four basal implants for a circular bridge brings most freedom for the prosthodontist, is safe and in most cases, sufficient. Complications associated with basal implants are rare and have proven to be easy to handle. The clinical application of BOI® implants is safe and effective and useful in a broad range of indications.

References

1. Talberktsson et al; the long term efficacy of currently used dental implants: a review and proposed criteria of success. Jomi jan 1986.
2. Artur Blaszczyszyn; Immediate loading of an implant with fine threaded neck – bone resorption and clinical outcome of single tooth restorations in the maxilla; Biomed Tech 2012; 57:3–9
3. Sigmar Kopp ; Basal implants: A safe and effective treatment option in dental implantology ; Cranio-maxillofacial Implant Directions® Vol.2 No.3 September 2007
4. Ihde S: Principles of BOI. Springer Berlin Heidelberg New York ISBN 3-540-21665-0, 2005
5. Petr Marcian et al; Bio mechanical study of disc implants part II , engineering mechanics, vol.17, 2010, 111-121
6. SAP_BOI-TOI-Diskos-BCS.en.indd; 05.07.2010
7. Sigmar Kopp, Comparison of immediate Vs delayed basal implants Journal of Maxillofacial & Oral Surgery 2008 Vol. 7 : No. 1
8. Esposito M et al; Interventions for replacing missing teeth: antibiotics at dental implant placement to prevent complications Cochrane Database of Systematic Reviews 2003, Issue 3. Art. No.: CD004152. DOI: 10.1002 / 14651858. CD004152
9. Himadri Chakrabarty; Treatment In A Patient With Bilateral Congenitally Missing Maxillary Lateral Incisors : A Different Approach With Basal Implants, Rujods, Ranchi University, Vol - 2 No.-1 June 2013
10. Kesava, Reddy K, Implant Stability Guident;2012, Vol. 5 Issue 8, 20
11. Misch CE et al , Implant success, survival, and failure: the International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference Implant Dent -;17 (1); 5-15.
12. Sigmar Kopp, Comparison of immediate Vs delayed basal implants Journal of Maxillofacial & Oral Surgery 2008 Vol. 7 : No. 1
13. William C. Scarfe, What is Cone-Beam CT and How Does it Work? Dent Clin N Am 52 (2008) 707–730
14. Peter Homolka; Bone Mineral Density Measurement with Dental Quantitative CT Prior to Dental Implant Placement in Cadaver Mandibles: Pilot Study Radiology _ July 2002
15. Goran Augustin; Temperature changes during cortical bone drilling with a newly designed step drill and an internally cooled drill, International Orthopaedics (SICOT) (2012) 36:1449–1456
16. Scortecci g. Immediate function of cortically anchored disk-design implants without bone augmentation in moderately to severely resorbed completely edentulous maxillae. J oral implantol. 1999;25(2):70–79.
17. Stefan ihde: case report: restoration of edentulous mandible with 4 boi implants in an immediate load procedure biomed. Papers 148(2), 195–198 (2004)
18. T. Goldmann, s. Ihde bendable vs. Angulated dental implants: consideration of elastic and plastic material properties based on experimental implant material data and fea biomed pap med fac univ palacky olomouc czech repub. 2008, 152(2):309–316
19. Gintaras Juodzbalys; Clinical and Radiological Classification of the Jawbone Anatomy in Endosseous Dental Implant Treatment J Oral Maxillofac Res 2013 (Apr-Jun) | vol. 4 | No 2 | e2 | p.1.

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CASE REPORT

Dentigerous cyst in a maxillary sinus originating from an ectopically erupted maxillary third molar - A case report

Benny Joseph[1], Suresh Vyloppilli[2], Manoj Kumar K. P.[3], Anroop Anirudhan[4], Nithin Kumar [5], Shermil Sayd[6]

Abstract

Dentigerous cyst arises from the reduced enamel epithelium and may extend into the surrounding bone, growing unnoticed to such extensive sizes as to occupy a considerable portion of the maxillary sinus. An ectopically erupted tooth associated with a dentigerous cyst in the maxillary sinus presents itself as a confounding problem which may lead to chronic maxillary sinusitis. A case of such a dentigerous cyst associated with an ectopic maxillary third molar tooth in the left maxillary sinus cavity is presented, which is of interest because of its less commonly occuring site, and the age of the patient who is only 15 years of age. Initially conventional radiographic techniques such as orthopantamogram(OPG) and later advanced imaging methods like computed tomography (CT) was carried out to determine its extent because of the aggressive radiographic feature and the cyst was enucleated in-toto.

Keywords: maxillary third molar, ectopic eruption, dentigerous cyst, maxillary sinus

Introduction:

Dentigerous cysts (DC) are the most frequent type of developmental odontogenic cyst derived from the tooth-forming organ.[1,2,3] It most commonly occurs in the 2nd to 3rd decades of life.[4] It originates by separation of follicle and filling with fluid from around the crown of an unerupted tooth. DC is the second most common odontogenic cyst, next to radicular cyst. The teeth most involved are in descending order of occurrence, mandibular third molars, canines, & second premolars and lastly maxillary third molars.[5,6] It may also be associated with an impacted, supernumerary or an ectopically erupted tooth. Most commonly observed ectopically erupting teeth are mandibular third molars.

Radiographically DC appears as unilocular radiolucent shadow with well defined sclerotic border, when infected, will show ill defined borders, associated with the crown of unerupted tooth. [7,8]

This article describes a case of aggressive infected DC arising from an ectopically erupted left maxillary third molar in the maxillary sinus in a 15 year old female patient, mimicking a potentially aggressive lesion extending into the ethmoidal and frontal sinuses, and eroding the orbital floor.

Case report:

A fifteen year old female patient reported to our Department of oral and maxillofacial surgery, KMCT Dental College and hospitals, with a chief complaint of foul smelling discharge from behind the left last tooth since 1 year, with a slow growing swelling over the left cheek. Patient had consulted specialists with a chief complaint of chronic rhinitis, intra oral discharge and headache one year back. Patient was diagnosed with chronic sinusitis and was given repeated antibiotics for the past one year. Despite being treated with antibiotics, the discharge persisted and the swelling slowly increased in size, without any pain. There was also a history of occasional discharge from the left nostril.

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Figure - 1 Mucobuccalfold Obliteration

On clinical examination, patient was found missing the maxillary left third molar. No tenderness was elicited over the left maxillary sinus. Left submandibular nodes were palpable and tender. Intraorally, the mucobuccal fold was obliterated in the region from the distal aspect of the 25 and extending posteriorly by a soft, fluctuant, non tender swelling (figure 1). Pus-discharge was noted distal to 27 arising from the gingival margin.

An OPG was advised, which revealed the presence of an ectopically erupted tooth 1.5 cm above the root of the 27, with the tooth in the middle third of the left maxillary sinus, which appeared hazy. Aspiration was done and serous purulent fluid was obtained, confirming the provisional diagnosis of infected cyst.

Due to the inconclusiveness from OPG about the extent, a CT was advised in the sagittal and coronal sections at the level of the maxillary sinus. It revealed a soft expansile soft tissue dense lesion 5 cmX4 cmX3.6 cm with a thin bone rim occupying the whole of the left maxillary sinus, with a tooth visible within the lesion in its anterior aspect. Posterior and inferior margins of the lesion

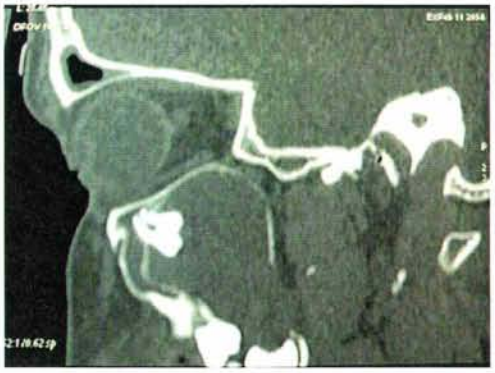

Figure - 2 Sagittal Section Showing Cross Section Of Tooth In Maxillary Sinus

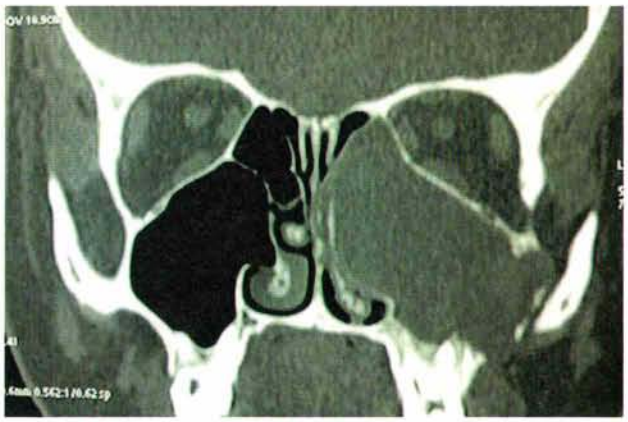

Figure - 3 : Coronal Section Showing Extent of Frontal and Ethmoidal extent of the Lesion

Figure - 4 : Bony Window Through Which The Lesion Was Enucleated

showed bone erosion, while the margins were well defined without infiltration. This was indicative of an infected DC in the maxillary sinus (figure 2 & figure 3). Mucosal thickening was also noted in the left frontal and ethmoidal sinuses. The lesion was extending till the ethmoidal and frontal sinuses and was eroding the lateral wall of the nose and orbital floor.

Surgical technique:

The patient was taken up for surgical enucleation of the cyst under general anesthesia and empirical antibiotic therapy was started. A

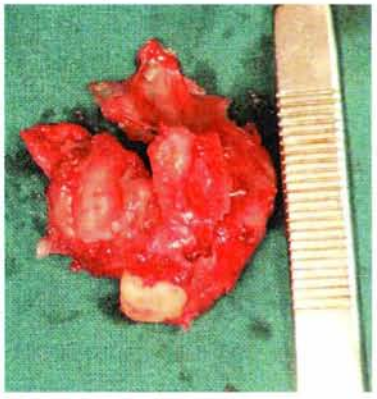

Figure - 5 Excised Lesion With The Involved Tooth

transvestibular incision was placed extending from the distal aspect of the second molar, a releasing incision placed in between the lateral and central incisor. A bony window was created (figure 4) and the tooth, including the whole of the lesion was removed in-toto (figure 5). Peripheral ostectomy was done were possible. The cavity created was irrigated well, and a gauze pack was placed which was removed on the third post operative day intraorally. Closure was done using 4-0 vicryl, continuous interlocking sutures. The resected section was sent for histopathological studies. After the surgery patient was also advised with nasal drops and steam inhalation. Patient was discharged on the fifth post operative day with oral antibiotics. Patient was reviewed first week, first month and third month and was relatively free of symptoms.

Histopathology of the specimen revealed a cystic lining, lined by flattened cells of stratified squamous epithelium and at places covered by granulation tissue and infiltration by mononuclear cells, suggestive of infected DC

Discussion;

Ectopic eruption of a tooth into the dental environment is a relatively common occurrence, whereas ectopic eruption of a tooth in other sites is rare.[9] However there have been few reports of tooth being erupted in the nose, condyles,[1] coronoid process and maxillary sinus. DC is the most common of all developmental cysts, more common in males, occuring in the second and third decades of life. About 70% of DC occurs in the mandible and 30% in the maxilla. [4] DC is often asymptomatic, but can enlarge and cause symptoms related to expansion and impingement on contiguous structures. Patient with DC involving the maxillary sinus might present with sinusitis, proptosis, diplopia, ptosis, epiphora, but rarely affects visual acuity. Fracture of the orbital bone has been reported.[10]

Most of the DC's are discovered accidentally on routine radiographic examination. Radiographically it is difficult to distinguish from other jaw cysts as most of them present as well circumscribed radiolucent lesions. Routine CT imaging is debatable, however, is better reserved for large lesion, in particular those involving the maxilla, in which case nasal cavity, orbital or pterygomaxillary space extension may occur.[11]

Differential diagnosis includes odontogenic keratocyst, adenomatoid odontogenic tumor, calcifying epithelial odontogenic cyst, CEOT, and unicystic ameloblastoma. In addition to the histopathological and radiological alteration, researchers recently proved that the biochemical markers such as BMP-4[12] and immunohisto chemical markers such as Bcl-2, Bcl-x_L can be used for differentiation of DC with OKC and unicystic ameloblastomas.[13] Due to diverse disease entities, expansile lesion of the maxilla includes malignant tumors and benign conditions including fibro-osseous diseases & mucoceles. The exact site of origin is very important for differential diagnosis.[14]

Since its introduction the Caldwell luc procedure has become a standard approach for management of antral disease as well as operative route to reach such sites as the pterygomaxillary space, orbit ethmoid labyrinth and medial skull base. The advancement in endoscopic sinus surgery however has changed many indications for Caldwell luc procedure. However conditions like this where an aggressive, suppurative, lesion with a tooth within the maxillary sinus, Caldwell luc procedure itself might prove beneficial.

Conclusion

Diverse disease entities may cause malignant and benign expansile masses in the maxilla. The CT may be helpful in defining the extent especially in lesion with larger dimensions. Infected DC may show features of malignant tumors. The standard treatment for DC is enucleation and removal of the involved teeth. Marsupialization is suggested in the pediatric group, and so was not attempted in this patient. If left untreated other than the usual complications, it can undergo carcinomatous transformation like epidermoid carcinoma.

References

1) Amin ZA, Amran. M, Khairudin.A, Removal Of Extensive Maxillary Dentigerous Cyst Via Caldwell Luc Procedure, Arch orofac Sci. 2008;3:48-51

2) Hasbini AS, Hadi U and Ghafari J, Endoscopic Removal Of An Ectopic Third Molar Obstructing The Osteomeatal Complex. Ear Nose Throat J, 2001;80(9): 667-670.

3) Kaya O and Bocutoglu O. A Misdiagnosed Giant Dentigerous Cyst Involving The Maxillary Antrum And Affecting The Orbit. Aust Dent J,1994; 39(3): 165-167.

4) Guruprasad Y, chauhan DS, Kura U. Infected Dentigerous cyst Of Maxillary Sinus Arising From An Ectopic Third Molar. J Clin Imaging Sci 2013; 3 S1: 7

5) Szerlip L. Displaced Third Molar With Dentigerous Cyst-An Unusual Case. J Oral Surg. 1978; 36:551-552

6) Elango S, Palaniappan SP. Ectopic Tooth In The Roof Of The Maxillary Sinus. Ear Nose Throat J. 1991:; 70 : 365-366

7) Wang CJ, huang PH, wang YL, shyng YC, kao WB, Dentigerous Cyst Over Maxillary Sinus: A Case Report And Literature Review, Taiwan J Oral Maxillofac Surg 2009;20: 116-124

8) Wood NK, Goaz PW. Differential Diagnosis of Oral Lesions. 5th ed. St. Louis Mosby 1997: 283-288.

9) Srinivasa PT, Sujatha G, Niazi TM, Rajesh P: Dentigerous Cyst Associated With An Ectopic Third Molar In The Maxillary Sinus: A Rare Entity. Indian J Dent Res 2007, 18:141-143

10) Omer K, Onder B. A Misdiagnosed Giant Dentigerous Cyst Involving The Maxillary Antrum And Affecting The Orbit. Case Report. Aust Dent J 1994; 39: 165-167.

11) Kerr JT, Steger J and Sorensen D. Midline Maxillary Odontogenic Keratocyst. Ann Otol Rhinol Laryngol, 2004; 113(9): 688-690.

12) Kim SG, Yang BE, Oh SH, Min SK, Hong SP, Choi JY. The Differential Expression Pattern Of BMP-4 Between The Dentigerous Cyst And The Odontogenic Keratocyst. J Oral Pathol Med 2005; 34: 178-183.

13) Kumamoto H, Ooya L. Immunohistochemical Analysis Of Bcl-2 Family Proteins In Benign And Malignant Ameloblastomas. J Oral Pathol Med 1999; 28: 343-9.

Han MH, Chang KH, Lee CH, et al, Cystic Expansile Masses Of The Maxilla: Differential Diagnosis With CT And MRI, AJNR Am J Neuroradiol 1995;16:333-8

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CASE REPORT

Resolution of HPV Associated Persistant Oral Papillomatosis By Electrosurgery - A Case Report

Rama Mohan Kodali[1], Sreeja[2], Koteswara Rao[3], Leela Krishna[4], Vijaya Lakshmi[5]

Abstract :

Human papilloma (pap-uh-lo-muh) virus are a group of more than 150 related viruses. HPVs are called papilloma viruses because some of the HPV types cause warts or papillomas, which are non-cancerous tumors. On the basis of their DNA, about 90 specific HPV types have been cloned and fully characterized. We report a case of extensive papillomatosis of the palate and buccal mucosa. The condition resembled inflammatory papillary hyperplasia. The lesions were excised under local anesthesia by electrosurgery without any complication.

Keywords: Human papilloma virus, elecrosurgery

Introduction :

Human papillomavirus (HPV) is a virus from the papillomavirus family. Like all papilloma viruses HPVs establish productive infections only in keratinocytes of the skin or mucous membranes.[1] While the majority of the known types of HPV cause no symptoms in most people, some types can cause warts (verrucae), while in a minority of cases cancers of the cervix, vulva, vagina, penis, oropharynx and anus may occur. On the basis of their DNA, about 90 specific HPV types have been cloned and fully characterized.[2] An increasing body of molecular–epidemiological evidence indicates that some types of oncogenic human papilloma virus (HPV) are associated with intraepithelial neoplasia. Each HPV virus in the group is given a number, which is called an HPV type.[3]

Low-risk HPV types

Some types of genital HPV can cause cauliflower-shaped warts on or around the genitals and anus of both men and women. In women, warts may also appear on the cervix and vagina. This type of genital wart is called a condyloma acuminatum and is most often caused by HPV-6 or HPV-11. As these genital warts very rarely grow into cancer, HPV-6 and HPV-11 are called low-risk viruses. These low-risk types can also cause low grade changes in the cells that do not develop into cancer.

High-risk HPV types

Other types of genital HPV have been linked with cancers in both men and women. These types are called high-risk because they can cause cancer. They also cause low-grade and high-grade changes in the cells and pre-cancers.[3] The high-grade changes and pre-cancers are more likely to grow into cancers over time. Various studies report that 50% to 90% of oral squamous cell carcinomas contain HPV types 16 or 18.[4] The protein E6 of HPV-16 is capable of binding to protein p53, enhancing its degradation and altering the control of cell growth.

According to Barzal-Nowosielska et al,[6] infection by HPV and/or alterations in protein p53 can co-exist in papillomas of the oral cavity, as these authors demonstrated over expression of p53 in 55% (n = 36) of the cases of papillomas evaluated. Immunohistochemical assays for p53 protein were negative for the great majority of the specimens

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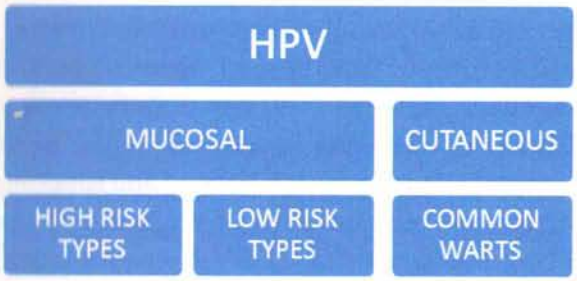
evaluated, suggesting a benign character for the lesions and a small risk of becoming malignant.[7]

HPVs specifically target the undifferentiated proliferative basal cells of epithelial mucosa that are exposed following tissue trauma.[8] HPV proteins, especially the oncoproteins E6 and E7 of the high risk HPVs (HR-HPVs), interact with different degrees of affinity, with host cell proteins to disturb the normal epithelial differentiation and apoptosis by stimulating cellular proliferation, DNA synthesis and inhibition of cell cycle regulators (Doorbar, 2007).[9]

Common high-risk HPV types include:

· HPV-16, 18, 31, 33, 35, 39, 45, 51, 52, 58, 59, 68



Case Report

A 65-year-old woman was referred to department of oral and maxillofacial surgery, Drs Sudha & Nageswara Rao Siddhartha Institute of Dental Sciences with a history of generalized enlargement of the maxillary and mandibular labial gingiva. Pedunculated papillary warty lesions noticed over right and left labial mucosa and palate with no signs of bleeding or pus discharge. Patient exhibited severe epithelial dysplasia and concurred with generalized gingival hyperplasia (Fig.1).

Provisional diagnosis is given as HIV associated multifocal papillomatosis. Differential diagnosis is given as hecks disease, verrucous leukoplakia or verrucous carcinoma. Incisional biopsy was done, PCR isolated HPV 16 virus and the patient is non reactive for HIV.

Under LA (2% lignocaine with adrenaline) using electrocautery, cauterization (Fig.2,3) was done with ball electrode in right anterior labial region. Patient was recalled after 1 week.

Fig.1: Oral papillomatosis of the labial gingiva

Fig.2: Use of electrocautery (Right side)

Fig.3: Use of electrocautery (Right side)

Fig.4: Regression of the lesions

The lesions on operated site resolved (Fig.4) and hence electrocautry was done on left labial mucosa and palatal region (Fig 5,6). The patient was reviewed after one week and regression of the lesions was observed. A postoperative review of

Fig.5: Electrocauterization on the left side

Fig.6: Electrocauterization on the left side (palatal mucosa)

one month showed good signs of healing with no recurrence.

Discussion :

Human papilloma virus (HPV) can cause various conditions in the oral mucosa that are characterized by epithelial growths, most of them are benign.

Clinically, HPV-related lesions are often asymptomatic, soft, exophytic, cauliflowerlike, pedunculated in appearance, and vary in color from white to barely red or normal.[10] The largest lesion is usually limited to less than 1 cm. Oral HPV lesions tend to present more often on the vermilion border of the lip, hard and soft palates, and uvula than on other intraoral mucosal sites.

Head and neck lesions associated with HPV include oral squamous papilloma, common warts, oral and cutaneous verruca vulgaris, condyloma acuminatum, laryngeal papillomatosis, conjunctival papillomatosis, focal epithelial hyperplasia, and squamous dysplasia or neoplasia, or both. The main route of transmission is direct genital and orogenital sexual contact with infectious lesions.[10]

Cytodestructive methods (such as liquid nitrogen, electrocautery,or carbon dioxide [CO2] laser photocoagulation),chemotherapeutic agents (such as podophyllotoxin, trichloracetic, or retinoic acid), and immunostimulants (such as topical or intralesional interferon [IF]-á) are currently being used.[11] Mucocutaneous, HPV-associated wart-like lesions, including those of the gingival,[12] have been treated with some success with the nucleotide analogue cidofovir; and immune-response modifiers such as imiquimod, singly or in combination with antiviral agents, appear promising in the reversal of early intraepithelial neoplasias.[13]

Within the surgeon's armamentarium, electrosurgical devices stand out as some of the most useful and most used instruments.[14] Electrosurgical instruments are undoubtedly some of the most useful and most-often used tools at the surgeon's disposal. But there are potential applications for which these instruments are not commonly used.

The clinical presentation and the general architecture of the biopsy specimens were congruent with the classical definition of inflammatory papillary hyperplasia of the palate. The causal relation between HPV 16 and subgroups of squamous cell carcinoma of the head and neck has been established,[15] and HPV 16 gene expression has been reported as frequent in distinct types of oral mucosal lesions, such as koilocytic dysplasia[16] and proliferative verrucous leukoplakia.[17]

Conclusion :

Thus the use of electrosurgery for the treatment of oral papillomatosis may not have a significant and established evidence but the favourable results obtained do increase the scope of this treatment option. Therefore in cases where there is no spontaneous regression of the lesions, electrosurgery can be used as one of the treatment options which is simple, cost effective and with less recurrence rates.

References :

1. Centers for Disease Control and Prevention. Human Papillomavirus (HPV). Accessed at www.cdc.gov/HPV/index.html on April 11, 2013.
2. Scully C, Cox MF, Prime SS, Maitland NJ. Papillomavirus: the current status in relation to oral disease. Oral Surg Oral Med Oral Pathol 1988;65:526-32.

3. Centers for disease control and prevention (cdc). April 10, 2008. retrieved 13 november 2009.

4. Epstein JB. Oral cancer. In: Greenberg MS, Glick M, eds.Burket's Oral Medicine: Diagnosis and Treatment. 10th ed. Ontario, Canada: BC Decker; 2003:194-234.

5. Badaracco G, Venuti A, Bartolazzi A, Morello R, Marzetti F, Marcante ML (2000) Overexpression of p53 and bcl-2 proteins and presence of HPV infection are independent events in head and neck cancer. J Oral Pathol Med 29, 173-179.

6. Barza´l-Nowosielska M, Miasko A, Chyczewski L (2004) Presences of human papillomavirus DNA (HPV) and immunohistochemical p53 overexpression in papillomavirus of oral cavity. Rocz Akad Med Bialymst 49; 105-107.

7. Oral squamous papilloma: clinical, histologic and immunohistochemical analyses Thalassa E. Carneiro, Sandra A. Marinho, Flaviana D. Verli, Ana T. M. Mesquita, Nádia L. Lima and João L. Miranda Journal of Oral Science, Vol.51, No. 3, 367-372, 2009.

8. Human papillomaviruses in oral carcinoma and oral potentially malignant disorders: a systematic review S Syrjanen, G Lodi, I von Bu ltzingslowen, A Aliko, P Arduino, G Campisi, S Challacombe, G Ficarra, C Flaitz, HM Zhou, H Maeda, C Miller, M Jontell Oral Diseases (2011) 17 , 58–72.

9. Doorbar J (2007). Papillomavirus life cycle organization and biomarker selection. Dis Markers 23: 297–313.

10. Neville BW, Damm DD, Allen CM, et al, eds. Oral & Maxillofacial Pathology. 2nd ed. Philadelphia, Pa: WB Saunders Co; 2001:315-387.

11. Sterling JC, Kurtz JB. Human papillomavirus.In: Rook,Wilkinson, Ebling, editors. Textbook of dermatology. 6th ed. Oxford (England): Blackwell Science; 1998. p. 1040-5.

12. Calista D. Resolution of recalcitrant human papillomavirus gingival infection with topical cidofovir. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000; 90(6):713–5.

13. Tyring S, Conant M, Marini M, Van Der Meijden W, Washenik K. Imiquimod; an international update on therapeutic uses in dermatology. Int J Dermatol 2002; 41(11):810–6.

14. Electrosurgery: History, Principles, and Current and Future Uses Nader N Massarweh, MD, Ned Cosgriff, MD, Douglas P Slakey, MD, MPH, FACS 10.1016/j.jamcoll surg.2005.11;17.

15. Gillison ML, Koch WM, Capone RB, Spafford M, Westra WH, Wu L, and others. Evidence for a causal association between human papillomavirus and a subset of head and neck cancers. J Natl Cancer Inst 2000; 92(9):709–20.

16. Fornatora M, Jones AC, Kerpel S, Freedman P. Human papilloma virus associated oral epithelial dysplasia (koilocytic dysplasia): an entity of unknown biologic potential. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1996;82(1):47–56.

17. Palefsky JM, Silverman S Jr, Abdel-Salaam M, Daniels TE, Greenspan JS. Association between proliferative verrucous leukoplakia and infection with human papillomavirus type 16. J Oral Pathol Med 1995; 24(5):193–7.

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REVIEW ARTICLE

Internal Derangement of Temporomandibular Joint : A Review

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Abstract

The Internal Derangement of Temporomandibular Joint is the most common non inflammatory abnormalities of the disc,observed even in asymptomatic subjects.Because the TMJ shows large adaptive & compensatory mechanism over dysfunctional disc motion,these disorders may be asymptomatic or minimally evident for a long time.A careful clinical evaluation,reinforced by imaging findings will help in differentiating asymptomatic derangements from painful conditions that may require treatment.

Keywords : Stress, Perodontal disease

Introduction

The Temporomandibular joint (TMJ) is a ginglymo-diarthrodial joint, a term that is derived from ginglymus, meaning a hinge joint, allowing motion only backward and forward in one plane, and arthrodia, meaning a joint of which permits a gliding motion of the surfaces. The common features of the synovial joints exhibited by this joint include a disk, bone, fibrous capsule, fluid, synovial membrane, and ligaments. However, the features that differentiate and make this joint unique are its articular surface covered by fibro cartilage instead of hyaline cartilage.[1]

'Temporomandibular joint (TMJ) internal derangement' was first described by Hey and Davies in 1984 as localized mechanical fault interfering with the smooth action of a joint and more recently has been defined as ' a disturbance in the normal anatomical relationship between the disc and condyle that interferes with smooth movement of joint and causes clicking, popping or locking'.[2]

The prevalence of temporomandibular joint (TMJ) dysfunction is increasing among people in the developed countries. Autopsy studies have detected internal derangement of the TMJ in 10- 47% of the general population. Kircos et al found anterior disc displacement by magnetic resonance imaging (MRI) in 32% of asymptomatic volunteers. A large number of individuals with anterior disc displacement however, do have discomfort. The principal symptoms include pain, limitation of mandibular movement and clicking.[1]

Classification of TMJ Internal Derangements

Dolwick and Sanders have described internal derangement as any disturbance between the articulating components within the joint. However, the term has been adapted mainly for changes in the disc-condyle relationship. The disc is commonly displaced anteriorly or anteromedially. More rarely, posterior or lateral displacements are encountered.

Disc displacements generally have been classified as disc displacement with reduction and disc displacement without reduction.

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This classification has been widely used, and has been adapted by Bronstein and Merrill to develop an arthroscopic classification correlated with the Wilkes staging classification.

Wilkes' Staging Classification (Wilkes 1989)[5]

Stage-I : Early disc displacement with reduction

A. Clinical: No significant mechanical symptoms other than early opening, reciprocal clicking, no pain or limitation of motion

B. Radiologic: slight forward displacement, good anatomic contour of the disc, negative tomograms

C. Anatomic/pathologic: excellent anatomic form, slight anterior displacement, passive incoordination demonstrable

Stage II: Late disc displacement with reduction

A. clinical: One or more episodes of pain, beginning with mechanical problems consisting of mid to late-opening, loud clicking, transient catching and locking

B. Radiologic: Slight forward displacement, beginning with disc deformity of slight thickening on the posterior edge, negative tomograms

C. Anatomic/pathologic: Anterior disc displacement, early anatomic disc deformity, good central articulating area

Stage III: Non reducing disc displacement- Acute

A. Clinical: Episodes of pain, major mechanical symptoms consisting of locking (intermittent or fully closed), restriction of motion, and difficulty with function.

B. Radiologic: Anterior disc displacement with significant deformity/prolapse of disc (increased thickening of posterior edge), negative tomograms

C. Anatomic/pathologic: Marked anatomic disc deformity with anterior displacement, no hard-tissue changes

Stage IV: Non reducing disc displacement- Chronic

A. Clinical: Slight increase in severity over intermediate stage

B. Radiologic: Increase in severity over intermediate stage, positive tomograms showing early, to moderate degenerative changes, flattening of eminence, deformed condyle, sclerosis

C. Anatomic/pathologic: Increase in severity over intermediate stage, hard tissue degenerative remodeling of both bearing surfaces (osteophytosis), multiple adhesions in anterior and posterior recesses, no perforation ofdisc or attachments.

Stage V: Non reducing disc displacement with osteoarthrosis

A. Clinical: Crepitus, scraping, grating, grinding symptoms, episodic or continuous pain, chronic restriction of motion, difficulty with function

B. Radiologic: Disc or attachment perforation, filling defects, gross anatomic deformity of disc and hard tissues, positive tomograms with essentially degenerative arthritic changes

C. Anatomic/pathologic: Gross degenerative changes of disc and hard tissues, perforation of posterior attachment, multiple adhesions, osteophytosis, flattening of condyle and eminence, subcortical cystic formation.[2]

Internal derangement is defined as any interference with smooth joint movement. Disc derangement is defined as a malposition of articular disc relative to condyle and eminence. Theoretically, a disc may be displaced to various degrees and in any direction ie anterior, posterior, lateral or medial. Rarely disc displaced purely in one direction, with the possible exception of anterior displacement. Posterior displacements have been described but are infrequent. The most common type of disc derangement is anterior displacement. The various types of internal derangements of TMJ are given below

1. Disc derangement with reduction
2. Disc derangement with out reduction
3. Disc adherence
4. Disc adhesion
5. Subluxation (hyper mobility)
6. Joint dislocation

Disc Displacement with Reduction (DDWR)

Closed: - It is defined as a condition in which the articular disc of the TMJ is displaced while the mouth is closed and teeth are together in maximal occlusion. On opening condyle pushes against the posterior band of the disc until the condyle able to slide or snap under the posterior band of disc, and disc reduces to its position on top of the condyle. Overcoming the thick posterior band of the disc is believed to be responsible for the clicking or popping sounds. Typically, the opening click occurs later during opening movement, where as closing click occurs close to maximal occlusion.

Open : - Disc displacement with reduction derangement could be found with a clicking sound over the joint without associated pain. It is seen in over 50% of normal subjects. However, there is another type of DDWR derangement which has clicking of the joint associated with pain. The clicking is due to the noise the condyle makes as it moves under the anteriorly displaced disc. The pain is due to the stretching and subsequent inflammation of the retrodisc pad.

Disc Displacement without Reduction (DDWOR)

It is defined as a condition in which the condyle is unable to slide or snap back underneath the disc. The anteriorly displaced disc thus does not reduce to its position on top of the condyle during opening movement. It is characterised with a persistent closed lock. The closed lock is due to the inability of the condyle to slide under the anteriorly displaced disc. Hence, there is usually no associated click or pop on physical exam and mouth opening is limited.

Disc Adherence

Disc adherence is defined as a temporary sticking of the disc either to the condyle or the fossa.[6]This adherence can be caused by prolonged static loading or lack lubrication or combination. Often times patients report difficulties with jaw opening on awakening. On attempts to move the jaw, generally the adherence can be overcome, this is often accompanied by a loud single pop or click. The condition should not confused with disc derangement with reduction or subluxation.

Disc Ahesion

It is defined as a fibrotic connection between the disc and the condyle or the disc and the fossa. This condition is characterized by limited jaw movements. In contrast with adherence, an adhesion can not be overcome by simple jaw movements. This condition should be distinguished from disc derangement with out reduction or fibrous ankylosis.

Subluxation

It is defined as an overextension of the disc-condylar complex on opening. On opening disc-condylar complex passes beyond the eminence. Typically, this is accompanied by a dull sound. The sound may be reciprocal ie that may occur on opening and on closing. The sound typically occurs, unlike in the disc derangement, late in opening phase and early in closing phase. The subluxation may be habitual, amending that the disc-condyle complex passes the eminence back and forth without causing pain, discomfort, or dysfunction during routine opening.

Joint Dilocation

It is defined as a dislocation of the entire disc-condylar complex beyond the eminence combined with the inability to return passively into the fossa. The patient is unable to close the mouth because the disc-condylar complex is trapped in front of the eminence.

Etiology

The exact etiology and pathogenesis of TMJ dysfunction is unclear. However the possible causative conditions are-

1. Effusions and haemarthroses
2. Structural abnormalities of the articular surfaces
3. Intracapsular adhesions
4. Arthropathies like:
   - Inflammatory joint disease[7]
   - Osteo-arthritis[8]
   - Osteochondritis[9].
   - Crystal deposition arthropathy.

Pathogenesis

The first abnormality noted by the patient will usually be a click on opening. Previous trauma may lead to a stretching of the lower lamina of the bilaminar zone, allowing posterior band to sublux forward in relation to the codylar head in centric relation. An opening click represents this band relocating posteriorly over the condyle from its subluxation position, with a reciprocal late click occurring during closure. It remains painless, if the insertions of the meniscus to the medial and lateral poles are undisturbed, and the joint is stable.

When pain develops it may assumed that the meniscus is beginning to lose its insertion into the lateral pole, the joint becomes marginally unstable, and accurate fit of the condyle into the meniscus, and the meniscus into fossa and the eminence, is disturbed.. The inflammation that is associated with the damage both to the meniscal attachment, and also to the joint surfaces by the incorrect positioning of meniscus, will lead to exudates and eventually adhesions and fibrosis. These will serve to maintain the meniscus in its subluxed position and the joint becomes locked, the chief symptom now being painful restriction of opening.

Painless clicking is a result of subluxation of posterior band. Reciprocal painful clicking represents subluxation of the whole meniscus forwards and medially from its normal position in centric relation, but with sufficient mobility for it to re-achieve its correct position over the condyle on opening. As the mouth closes, the condyle raises in an upward and backward direction across the eminence, the meniscus begins this same movement, and then suddenly subluxes forward once more, anterior-medial to the condyle. The later the opening click, and earlier the closing click, the more the meniscus is subluxed.

When click no longer occurs and jaw becomes locked, the subluxation of the meniscus is complete, lying anterior and medial to the condyle and unable to regain its correct position. The patient is only able to open between 20 and 25 mm at the incisors. The meniscus may remain in this position due to straight forward mechanical displacement or as is found often at surgery, restrained their by adhesions particularly to the eminence. In some joints, the subluxed meniscus is found to be buckled in its anterior-medial location, even to the point of being completely folded upon itself.

As the meniscus becomes ectopic, surgical evidence suggests that the condyle head remodels to accommodate it. This may happen without destructive changes to the condyle. McCarthy and farraar have stated that the condyle remoulds progressively to restore the vertical height of the ramus, which suggests that the condylar height increases.

Methods for Diagnosis

1. History : Negative

Symptoms of muscle incoordination may be present, even with a healthy joint, and so any muscular problems must be distinguished from signs and symptoms of a true intracapsular disorder.

2. Clinical Observations

The most salient sign of disc derangement with reduction is palpable, audibe click on opening. When there is a closing click it is called as reciprocal clicking. On occasion the click is not audible but may be heard by auscultation. In addition, the shift in disc position may be felt by palpation. Other signs of disc derangement with reduction may include a click on protrusion or lateral movements.

The most salient feature of an acute disc derangement without reduction is sudden limited mouth opening. The patient's history in the case of disc derangement with out reduction is essential and usually includes a sudden cessation of clicking is accompanied by a limited mouth opening. The clinical signs are related to the obstruction of translation of the condyle by the disc.

Manupulative Testing

The joints should be free of any sign of tension or tenderness while firmly loaded by bilateral manipulation. The mandible should be able to hinge freely, protrude, and move laterally while loaded without any sign of discomfort.

1. Palpation

Negative at joint, Muscles may or may not be tender to palpation.

2. Auscultation

A healthy joint is well lubricated with synovial fluids. If its fibrocartilaginous surfaces are intact, it should be noiseless in function. Doppler auscultation of the TMJ produces no crepitus sounds.

Imaging of the Temporomandibular Joint

The decision to image the TMJ is made after thorough evaluation of the patient history, clinical findings and in some cases response to conservative treatment. Several modalities are available to image the TMJ and the choice of imaging study depends on the provisional diagnosis and the type of information needed from the images. Imaging modalities may be categorized broadly into hard tissue and soft tissue techniques.

Panoramic Projection

The panoramic projection is considered a "screening" projection and must be used in combination with other hard tissue imaging techniques to image TMJ structures adequately. It offers an overall view of the TMJ, mandible, maxilla and teeth and is particularly useful for assessing mandibular symmetry and ruling out odontogenic disorders that may refer pain to the TMJ.

Plain Films

Plain films are radiographs made with a stationary x-ray source and film. Plain films often can be made with conventional x-ray equipment already available in many offices, although specialized equipment usually results in better image quality.

Transcranial projection

The transcranial projection is useful for an overall view of the joint and allows identification of gross osseous abnormalities of the lateral aspect of the joint, condylar fractures and range of motion [open views]. Also, it can only evaluate the lateral aspect of the TMJ and there is image distortion because of the oblique vertical angle of the x-ray beam.

Transpharyngeal projection

The transpharyngeal projection provides a sagittal [lateral] view of the condyle and is taken in the maximum open position only to avoid superimposition of the temporal component of the condyle.This projection may depict only gross osseousabormalities of the condyle, such as large erosions, osteophytes or fractures.

Transorbital and Reverse Open Towne's projection

The transorbital and reverse open Towne's projections provide a coronal [frontal] view of the condyles perpendicular to transcranial and transpharyngeal projections the articular eminence, condyle, and condylar neck.

Sub-mentovertex projection

The submentovertex projection is used for evaluating mandibular asymmetries, rotation of the mandible in the horizontal plane, condylar displacement, and zygomatic arch fractures.

Conventional tomography

Conventional tomography is used for visualization of the TMJ free of superimposition from overlapping structures, so osseous abnormalities are more readily apparent, provision of a true lateral and frontal view of the joint without using oblique vertical angulations, and the ability to evaluate lateral, central, and medial aspects of the joint individually

Advanced imaging techniques

Computed tomography

Computed tomography [CT] images are the most useful images for the diagnosis of osseous changes in the TMJ. Three-dimensional reformatted images [surface rendering], which allow evaluation of overall joint morphology, also can be produced.

Nuclear medicine

In nuclear medicine, radiotracer used are technetium 99m [Tc] and gallium [Ga]. Depending on the radiotracer chosen, it accumulates in areas of increased blood flow, increased bone turnover, or inflammation. The tracer emits gamma radiation, which is recorded by a gamma scintillation camera or other similar device, and an image of the area under investigation is produced.

Soft - Tissur Imaging Techniques

Because the articular disk is not visible with the techniques described previously, soft tissue imaging techniques are used to determine disk position and morphology. The two most commonly used methods are arthrography and MR imaging. An evidence-based evaluation of the literature by Liedberg et al indicates that arthrography may be more accurate for determining anterior anterior disk displacement.

Arthrography

In arthrography, the articular disk is visible as an indirect image between the outline of one or both joint spaces. A soft-tissue perforation between joint spaces may be observed fluoroscopically during injection of contrast, as both joint spaces fill simultaneously. Similarly, joint adhesions interrupt the smooth filling of contrast in the joint space. After contrast injection, disk function is studied in opening and closing movements.

In the double-contrast technique, some of the contrast agent is aspirated and a small amount of air is injected to improve visualization of disk morphology. It provides accurate information about disk morphology and position, injection of contrast agent may tear adhesions, which results in improved range of motion after the procedure, and the ability of therapeutic agents [Eg: corticosteroids] to be injected into the joint during the procedure.

Magnetic Resonance Imaging

In MR imaging, a magnetic field and radio-frequency pulses rather than ionizing radiation are used to produce multiple image slices. Strengths of MR imaging include its non-invasiveness with no reported morbidity, ability to detect medial and rotational disk displacement [coronal views], and ability to detect abnormalities in surroundingmuscles and soft tissues

Abnormalities of the articular disk:

If a disorder of the articular disk is suspected, then either arthrography or MR imaging can be prescribed. The decision between the uses of these two modalities is based on side effects and morbidity and other contraindications as described earlier, namely cost or availability. Based on the evidence currently available, MRI continues to be the gold standard for imaging disk position and the soft tissues of the TMJ, including joint effusions.[10]

Management

Internal derangement of the TMJ does not always cause pain, although when the disc becomes displaced, noises and locking can occur and ligamentous, capsular or retrodiscal pain may dominate the clinical picture. The condition is usually treated conservatively by jaw exercises or splints, but sometimes does not respond to treatment and operation is indicated.

Non Surgical Management

DIET:-A soft diet is often overlooked in the management of TMD. A soft diet prevents overloading of the TMJ and decreasesmuscle activity that may be hyperactive.The extent of time that a patient should beplaced on a soft food diet is dependent onthe severity of symptoms. Patients shouldbe instructed to cut their food into smallpieces and abstain from eating chewy,hard, or crunchy foods. Uncooked vegetablesand meats represent examples offoods that should not be eaten by thesepatients. A strict liquid diet is reserved forthose patients experiencing severe TMDsymptoms

Pharmacotherapy

Four types of medication have been widely used in the treatment: (1) NSAIDs, (2) muscular relaxants, and (3) tricyclic antidepressants.

NSAIDs not only reduce inflammation but also serve as an excellent analgesic.

Muscle relaxants may provide significant improvement in jaw function and relief of masticatory pain.. In many patients with acute pain or exacerbation of muscular hyperactivity, muscle relaxants can be considered for short periods, such as 10 days to 2 weeks. The lowest effective dose should be used. Diazepam 2 to 5 mg or cyclobenzaprine10 mg generally provides adequate relief of muscular symptoms in patients with TMD

Tricyclic antidepressants in low doses appear to be useful in the management of patients with chronic pain. Tricyclic antidepressants prevent the

reuptake of amine neurotransmitters, such as serotonin and norepinephrine, causing an inhibition of pain transmission.[3]

Splint Therapy

Occlusal splints are generally considered a part of the reversible or conservative treatment phase in the management of TMD patients. Splint designs vary; however, most splints can be classified into two distinct groups: (1) autorepositioning splints and (2) anterior repositioning splints.

Surgical Treatment

Internal derangement of the temporomandibular joint (TMJ) is usually characterized by anterior or anteromedial articular disc replacement. The patients are often treated successfully by physiotherapy, soft foods, analgesics, anxiolytic agents, and occlusal appliances. However, some patients do not benefit from these treatments and ultimately require surgical intervention involving disc repair, discectomy, or discectomy with insertion of an autogenous or alloplastic disc replacement.

The frequency of surgical intervention for treatment of internal derangement of the TMJ ranges from 1% to 25% in various published studies. The following surgical procedures are effective in treatment of temporomandibular joint with internal derangement:

Arthrocentesis and Lavage

Many types of internal joint pathology appear to respond well to arthrocentesis.[11] The most common use appears to be in patients with anterior disk displacement without reduction..Nitzan demonstrated that arthrocentesis produced significant improvement in incisal opening and reduction of pain in patients with persistent and severe closed lock. The simple flushing action in the joint may eliminate or decrease biochemical factors contributing to inflammation and pain.[12]

Arthroscopic Surgery

The technique of arthroscopy of the TMJ was developed in Japan in the early seventies (Ohnishi, 1975). With the refinement of equipment and surgical skills, TMJ arthroscopy has been established as a diagnostic tool and a surgical method as well (Murakami et al., 1986; Sanders, 1986). In the early nineties, techniques for the arthroscopic management of disc displacement by use of lasers, electric diathermy or intra-articular suturing have been described (Ohnishi, 1991; McCain et al., 1992a; Koslin and Martin, 1993). Advanced arthroscopic surgical procedures were designed for the management of severe degenerative changes of joint surfaces (Quinn, 1994). In 1986, Sanders described a simple method (single puncture) of lysis and lavage of the TMJ. It has been widely used, and several investigators have reported on its efficacy and non-invasiveness.[13]

Disk - Repositioning Surgery

During the late 1970s and 1980s one of the most commonly performed TMJ surgical procedures was disk repositioning and plication. The indication for this procedure is anterior disk displacement that has not responded to nonsurgical treatment and that most frequently results in persistent painful clicking joints or closed locking (i.e., anterior disk displacement with or without reduction). After surgery, patients generally begin a nonchew diet for several weeks, progressing to a relatively normal diet in 3 to 6 months. A progressive regimen of jaw exercises is also instituted in an attempt to obtain normal jaw motion within 6 to 8 weeks after surgery.[14]

Disc Plication

Plication involves folding or taking a tuck to reduce the size of the disk. It consists of removing a wedge from the redundant posterior attachment of an anteriorly displaced disk. The segments are sutured together. Partial-thickness plication involves repositioning the disk without violating the lower joint space. Full-thickness plication means repositioning the disk by surgically exposing the lower joint space

Bilaminar Flap Repair:

Bilaminar flap repair is an alternative technique to diskectomy. The surgical technique to repair perforated and badly damaged disk uses

the preauricularendaural approach to expose the capsule and to enter the joint space

Disk - Removal Procedures

Partial Diskectomy:

The partial diskectomy procedure is used to correct partial reducing disk displacement. The goal of the procedure is to excise the pathologic posterior attachment and that portion of the displaced atrophic/ resorbed disk that represents an obstruction or is presumed to be responsible for terminal jolting. The portion of the disk that is properly positioned, usually the medial aspect of the disk, is left in place.

The rationale for electing to perform a partial diskectomy rather than a disk repositioning is based on the belief that those factors responsible for the initial disk displacement are often not adequately controlled or identified and thus eventually cause redisplacement of the disk.The perforation repair is performed over the head of the condyle; such perforations can lead to chronic pain refractory to steroid injection.[15]

Total Diskectomy:

Total diskectomy is the procedure in which the remodelled posterior attachment and entire disk are excised. It is the most extensively used and reported surgical procedure, having been applied from as early as the 1900s. Total diskectomy has been used to treat the full gamut of internal derangements, without consideration for the degree of displacement of disk morphology, with generally good to excellent results[16]. The surgeon should remove all disk remnants that appear to impede movement.[17]

Disc Replacements

Autogenous, homologous, and alloplastic replacements for the disk have been used following diskectomy to prevent or reduce intra-articular adhesions, osseous remodeling, and recurrent pain. In addition, the interpositional material was believed to decrease joint noises by dissipating loading forces on the osseous surfaces. The effectiveness of interpositional grafts in reducing adhesions, protecting the articular surfaces, and diminishing pain and post diskectomy joint noise has not been substantiated. The use of these materials is sporadic and according to operator preference.

Alloplastic Materials :

The requirements for an ideal alloplastic implant are that it be biocompatible, easily secured, adaptable to the variable morphology of the recipient site, and resistant to the compressive and shear forces of the joint. Currently there is no alloplastic material or technique that fulfils all of these requirements. Computer aided design using three-dimensional computed tomography images of the TMJ may bring us closer to defining the ideal characteristics and design of the various components of the TMJ. Silicone elastomer is a rarely used implantable material.. Implants laminated with a composite of polytetrafluoroethylene (PTFE) and aluminum oxide were used extensively in the early and mid-1980s.

Condylotomy

The condylotomy procedure is an osteotomy performed through the condylar neck. Campbell, one of the originators of the technique, made the observation that symptoms of TM dysfunction disappeared after condylar fractures. This led to his application of the closed condylotomy to patients with TMJ symptoms refractory to nonsurgical therapy. The rationale behind its use in treatment of internal derangements was to produce anteromedial displacement of the condyle to change the condyle-disk-fossa relation, increase joint space, shorten the lateral pterygoid muscle, and alter load forces.

Modified Condylotomy

The modified condylotomy is a modification of the intraoral vertical ramus osteotomy used in orthognathic surgery to correct mandibular prognathism. The idea of performing osteotomy of the condylar process for treatment of temporomandibular disorders was derived from observations that patients who had sustained condylar fractures rarely complained of TMJ pain. In the 1980s Nickerson and Veaco developed the modified condylotomy as a means of treating TMJ pain when there is evidence of a reducing disk. A

study by Hall et al., conducted on 400 patients over a 9-year period, found good pain relief in about 90% of the patients treated

Condylectomy

Low condylectomy or simply condylectomy is the procedure that is defined as the removal of the entire condylar process. The procedure used to be performed to increase the joint space to alleviate pressure on nerve endings, but it has largely been abandoned in the surgical repertoire for treatment of internal derangements because of problems of reduced condylar mobility, mandibular deviations, and open bite. Osteotomy at condylar neck by blind gigli saw technique was suggested by Kostecka for the correction of open bite.

Postoperative Management

Good care after an operation is essential for obtaining an optimal outcome. Patient post operative instructions include the following : wound care,thermal applications,non chew diet regimen, medications, occlusal management, bruxism control as needed, joint motion plans, and any special instructions related to the specific operation. Active or passive joint exercise to increase range of motion is a key component of management after surgery long term follow up is recommended.

Complications

Complications may arise immediately (intraoperatively or within 24 hr) or be delayed (> 24 hr). Transient neuropraxia of the temporal branches of the facial nerve occurs in as many as 20 to 30% of cases. Typically, the injury is of little significance to the patient and resolves within 3 to 6 months. The incidence increases when a separate skin flap is raised. Rarely, the zygomatic branches and, even more rarely, the entire temporofacial division may be injured. Injury to the chorda tympani from aggressive condylar retraction in the medial aspect of the fossa may occur rarely as well.[18]Neuropraxia of the inferior alveolar and, less commonly, the lingual nerves may result from clamp placement for joint manipulation.

Auriculotemporal syndrome (gustatory sweating, Frey's syndrome) has been reported as a result of the dissection of the joint. Hemorrhage from the retrodiskal tissue may interfere with performance of the disk repair. Temporary control may be obtained with seating of the condyle in the glenoid fossa. Electrocautery, injection of epinephrine, or application of hemostatic agents while maintaining the mandible in the closed position may be necessary. Infections rarely occur. Microorganisms cultured may originate from the skin or external auditory meatus flora. Auriculitis and external otitis are more likely to occur with the postauricular and endaural approaches. To avoid contamination an ear packing is avoided as it frequently becomes dislodged during surgery. In addition, the ear is not suctioned during surgery. When the wound is closed the external auditory canal is irrigated gently with saline via an 18-gauge angiocatheter.

Postoperatively, joint sounds are a frequent occurrence, regardless of the surgery. The sounds following diskectomy may be the loudest. In some patients the sounds may be obtrusive enough to disturb them. The surgeon should delay reintervention until the patient is reevaluated at 6 to 12 months, as some sounds may become inconsequential to the patient.[19]

Conclusion

The temporomandibular joint is one of the most important yet most poorly understood of the many joints in the body, because of its unique anatomic position and association with other structures, an in depth knowledge of the structures and biomechanics is very essential for the successful treatment of any dentofacial problems faced by the patient.

TMJ internal disc derangements most often respond well to nonsurgical methods. An asymptomatic click does not warrant treatment. In line with the Clinical Practice Guidelines for TMJ Surgery, surgical options should only be used in cases of moderate to severe persistent pain or dysfunction, after reasonable conservative treatment has proven ineffective. Possible exceptions are acute disc adherences, and adhesions, in which surgical methods, such as arthrocentesis and arthroscopy, may be the first treatment of choice. For disc derangements, a multitude of surgical procedures are available, but recent advances in technology and philosophy

direct the surgical procedures of choice toward the minimally invasive technique, arthrocentesis, with arthroscopy as the next alternative.

References

1. Gustav O. Kruger. Text book of oral and maxillofacial surgery.6th edition.
2. JohnE.Deb. Norman, Paul Bramley. A textbook and colour atlas of the temporomandibular joint.
3. Peterson. Contemporary oral and maxillofacial surgery, 2nd edition.
4. X. Alomar. Anatomy of the temporomandibular joint.Semin Ultrasound CT MRI 2007; 28: 170-183.
5. WenkoSmolka, Chie Yanai. Efficiency of arthroscopic lysis and lavage for internal derangement of the temporomandibular joint correlated with Wilkes classification. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2008;106:317-23.
6. Reny de Leeuw, DDS. Internal Derangements of the Temporomandibular Joint. Oral Maxillofacial SurgClin N Am 20 (2008) 159–168.
7. RudigerEmshoff, KatharinaInnerhofer, AnsgarRudisch, and Stefan Bertram. Clinical Versus Magnetic Resonance Imaging Findings With Internal Derangement of the Temporomandibular Joint: An Evaluation of Anterior Disc Displacement Without Reduction. J Oral MaxillofacSurg 2002;60:36-41.
8. Charles H. Henry et al. Reactive arthritis and internal derangement of the temporomandibular joint. Oral Surg Oral Med Oral Pathol Oral Radiol and Endod 2007; 104:e22-e26
9. Emshoff R, Innerhofer K, Rudisch A, Bertram S. Internal derangement and osteoarthrosis are related to TMJ pain. J Evid Base Dent Pract 2002;2:295-296.
10. Emma L. Lewis, BDS, MBBS, M. Franklin Dolwick, DMD, PhD, Shelly Abramowicz, DMD,Stephanie L. Reeder, DMD. Contemporary Imagingof the Temporomandibular Joint. Dent Clin N Am 52 (2008) 875–890.
11. Dorrit W. Nitzan, DMD. ArthrocentesisdIncentives for Using This Minimally Invasive Approach for Temporomandibular Disorders. Oral Maxillofacial SurgClin N Am 18 (2006) 311–328.
12. Pedersen A, Hansen HJ. Long-term evaluation of 211 patients with internal derangement of the temporomandibular joint.Community Dent Oral Epidemiol 1987; 15: 344-7.
13. H. Yoshida , Y. Fukumurab, I. Tojyo , A. Yamaguchi.Operation with a single-channel thin-fibrearthroscope in patients with internal derangement of the temporomandibular joint. British Journal of Oral and Maxillofacial Surgery 46 (2008) 313–314.
14. Peter Rammelsberg, Peter R. Pospiech, Lorenz Jager, Jean-Marc.Variability of disk position in asymptomatic volunteers and patients with internal derangements of the TMJ. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 1997;83:393-9.
15. Paul J Walters. Correction of temporomandibular joint internal derangements via posterior auricular approach. J Oral MaxillofacSurg 1983;41,616-618
16. Michael Miloro, DMD, MD, and Brent Henriksen, DDS, MD.Discectomy as the Primary Surgical Option for Internal Derangement of the Temporomandibular Joint. J Oral MaxillofacSurg 68:782-789, 2010.
17. I-Y. Huang, S.-T.Lai, Y-H.Shen, P. Worthington. Interpositionalarthroplasty using autogenous costal cartilage graft for temporomandibular joint ankylosis in adults. Int. J. Oral MaxillofacSurg 2007; 36: 909–915
18. Costen JB. Neuralgia and ear symptoms associated with disturbed function of the temporomandibular joint. JAMA 1936; 107:252-258.
19. Vallerand WP, Dolwick MF. Complications of temporomandibular joint surgery. Oral MaxillofacSurgClin North Am 1990; 2: 481-488.

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REVIEW

Methods to accelerate tooth movement - A Review

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Abstract

Zygomatic implants are a good rehabilitation alternative for upper maxilla with severe bone reabsorption.These implants reduce the need for onlay-type bone grafting in the posterior sectors and for maxillary sinuslift procedures - limiting the use of bone grafts to the anterior zone of the upper jaw in those cases where grafting isconsidered necessary. Zygomatic implants are designed for use in compromised upper maxilla. They allow theclinician to shorten the treatment time, affording an interesting alternative for fixed prosthetic rehabilitation. Thisstudy confirms that zygomatic bone offers predictable anchorage and acceptable support function for prostheses in atrophic jaws. However, these implants are not without complications. Longer-term evaluations are needed of zygomatic implant survival in order to establish a correct clinical prognosis.

Key words: Zygomatic implants, atrophic upper maxilla, edentulism, dental implants.

Introduction

Orthodontics has been developing greatly in achieving the desired results both clinically and technically. This is especially so by using new technologies, like stimulation software, continuous modification of wires and brackets as a result of the biomechanical efficiencies in orthodontics has greatly improved. However, these biomechanical systems may have reached their limit and there is a need to develop new methods to accelerate teeth movement.

Today, it is still very challenging to reduce the duration of orthodontic treatments. It is one of the common deterrents that faces orthodontist and causes irritation among adults plus increasing risks of caries, gingival recession, and root resorption.

A number of attempts have been made to create different approaches both preclinically and clinically in order to achieve quicker results, before going into details of these attempts, we need to understand the basics of orthodontic tooth movements and the factors that initiate inhibition and delayed tooth movement.

Orthodontic tooth movement occurs in the presence of a mechanical stimuli sequenced by remodeling of the alveolar bone and periodontal ligament (PDL). Bone remodeling is a process of both bone resorption on the pressure site and bone formation on the tension site[1]. Orthodontic tooth movement can be controlled by the amount of the applied force and the biological responses from the PDL[2]. The force applied on the teeth will cause changes in the microenvironment around the PDL due to alterations of blood flow, leading to the secretionof different inflammatory mediators such as cytokines, growth factors, neurotransmitters, colony-stimulating factors, and arachidonic acid metabolites.[3,4]

There are three phases of tooth movement: the initial phase, which is characterized by rapid movement after the application of force; followed by a lag period, where there is little or no movement, and the last phase, where gradual or sudden increase of movement occur[5].

Biological approach

Experiments have been done using these molecules exogenously to enhance tooth movement both in animal experiments and humans. Example of these molecules are prostaglandin E (PGE), cytokines that include lymphocytes and monocytes-derived factors, receptor activator of

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nuclear factor kappa B ligand (RANKL), and macrophage colony-stimulating factor (MCSF)[6,7,8,9].

Effect of cytokines on tooth movement High concentration of cytokines such as interleukins IL-1, IL-2, IL-3 IL-6, IL-8, and tumor necrosis factor alpha (TNF) were found to play a major role in bone remodeling; more-over, interleukin-1 (IL-1) stimulates osteoclast function through its receptor on osteoclasts[3]. It was also found that mechanical stress due to orthodontic treatment increased the production of prostaglandin PGE and IL-1 beta in the periodontal ligaments.

Other cytokines which are also involved in the acceleration of tooth movement are RANKL, which is a membrane-bound protein on the osteoblasts that bind to the RANK on the osteoclasts and causes osteoclastogenesis[10,11,12]. On the other hand, osteoprotegerin (OPG) competes with RANKL in binding to osteoclast to inhibit osteoclastogenesis. The process of bone remodeling is a balance between (RANKL-RANK) system and OPG compound[11,12]. In relation to this, using biological molecules in the acceleration of tooth movement[13] has been shown in two unique experiments in which it was demonstrated that the transfer of RANKL gene to the periodontal tissue induced prolonged gene expression for the enhancement of osteo-clastogenesis and acceleration of tooth movements in rats. On the other hand, the transfer inhibited orthodontic tooth movements[12].

Also a correlation was found among RANK, OPG, and root resorption during orthodontic teeth movement, and patients with root resorption produced a large amount of RANKL in the compressed site[14].

Prostaglandin effects on tooth movement

Prostaglandins (PGs) are inflammatory mediator and a paracrine hormone that acts on nearby cells; it stimulates bone re-sorption by increasing directly the number of osteoclasts. In vivo and in vitro experiments were conducted to show clearly the relation between PGs, applied forces, and the acceleration of tooth movement.

It has also been shown that the administration of PGE2 in the presence of calcium stabilizes root resorption while accelerating tooth movement[13].

Effect of Vitamin D3 on tooth movement Vitamin D3 has also attracted the attention of some scientist to its role in the acceleration of tooth movement; 1,25dihydroxycholecalciferol is a hormonal form of vitamin D and plays an important role in calcium homeostasis with calcitonin and parathyroid hormone (PTH).

A comparison between local injection of vitamin D and PGEs on two different groups of rats was also investigated. It was found that there is no significant difference in acceleration between the two groups. However, the number of osteoblasts on the pressure side which wasinjected by vitamin D was greater than on the PGE2 side. This indicates that vitamin D may be more effective in bone turnover[14].

PTH effect on tooth movement PTH has been shown to accelerate orthodontic tooth movement on rats, which was studied by continuous infusion of PTH (1 to 10 ig/100 g of body weight/day) implantation in the dorsocervical region, and the molars were moved 2- to 3-fold faster mesially by orthodontic coil spring[15].

Relaxin effect on tooth movement

Relaxin effect has also been investigated. Relaxin is a hormone that helps during childbirth by widening of the pubic ligaments in females and is suggested to be present in cranial suture and PDL[16]. The role of relaxin is known in the re-modeling of soft tissue rather than remodeling of bone. It has been shown that it increases collagen in the tension site and decreases it in compression site during orthodontic movement[16,17]. Also, the administration of human relaxin may accelerate the early stages of orthodontic tooth movement in rat experiments[17]. However, another study showed that human relaxin does not accelerate orthodontic tooth movement in rats, but can reduce the level of PDL organization and mechanical strength of PDL and increase tooth mobility[18].

Device-assisted treatment

Another approach in accelerating tooth movement is by using device-assisted therapy .This technique includes direct electric currents, pulsed electromagnetic field, static magnetic field, resonance vibration, and low-level laser which was mostly investigated and gave the most promising results.

The concept of using physical approaches came from the idea that applying orthodontic forces causes bone bending (bone bending theory) and bioelectrical potential develops. The concave site will be negatively charged attracting osteoblasts and the convex site will be positively charged attracting osteoclasts[19]. The bioelectrical potential is created when there is application of discontinuous forces, which leads to the idea of trying cyclic forces and vibrations. It has been found that applying vibrations for different duration per day accelerated tooth movements between 15% and 30% in animal experiments[19,20].

Cyclical force device effect on tooth movement

We have also used this concept by using the cyclical force device with patients and achieved 2 to 3 mm/month of tooth movement. The vibration rate was 20 to 30 Hz and used for 20 min/day [21].

Low-level laser therapy

Photobiomodulation or low-level laser therapy (LLLT) is one of the most promising approaches today. Laser has a biostimulatory effect on bone regeneration, which has been shown in the midpalatal suture during rapid palatal expansion[22], and also stimulates bone regeneration after bone fractures and extraction site. It has been found that laser light stimulates the proliferation of osteoclast, osteoblast, and fibroblasts, and thereby affects bone remodeling and accelerates tooth movement. The mechanism involved in the acceleration of tooth movement is by the production of ATP and activation of cytochrome C, that low-energy laser irradiation enhanced the velocity of tooth movement via RANK/RANKL and the macrophage colony-stimulating factor and its receptor expression.

Low-level laser therapy can be a very useful technique for acceleration of tooth movement since it increases bone remodeling without side effects to the periodontium. Laser wavelength of 800 nm and output power of 0.25 mW have indicated significant stimulation of bone metabolism, rapid ossification[23,24], and also acceleration of tooth movement to 1.5-fold in rat experiments.

Surgical approach

Several surgical approaches that have been tried in order to accelerate tooth movement were interseptal alveolar surgery, osteotomy, corticotomy, and Piezocision technique.

Interseptal alveolar surgery

Interseptal alveolar surgery or distraction osteogenesis is divided into distraction of PDL or distraction of the dentoalveolar bone; example of both is the rapid canine distraction. The concept of distraction osteogenesis came from the early studies[25] of limb lengthening. Also from surgical treatments of craniofacial skeletal dysplasia, this concept was later adapted in relation to the rapid tooth movement.

In the rapid canine distraction of PDL, the interseptal bone distal to the canine is undermined surgically at the same time of extraction of the first premolars, thus, this will reduce the resistance on the pressure site. In this concept the compact bone is replaced by the woven bone, and tooth movement is easier and quicker due to reduced resistance of the bone [25]. It was found that these rapid movements occur in the initial phase of tooth movement especially in the first week[26].

In this technique the interseptal bone is undermined 1 to 1.5 mm in thickness distal to the canine after the extraction of the first premolar, and the socket is deepened by a round bur to the length of the canine. The retraction of the canine is done by the activation of an intraoral device directly after the surgery. It has been shown that it took 3 weeks to achieve 6 to 7 mm of full retraction of the canine to the socket of the extracted first premolars.

Corticotomy and osteotomy

Osteotomy and corticotomy are also surgical techniques that have been clinically used for many years. Osteotomy is when a segment of the bone is cut into the medullary bone and is separated and then moved as a unit as shown in[27,28].

Corticotomy is one of the surgical procedures that is commonly used in which only the cortical bone is cut and perforated but not the medullary bone, suggesting that this will reduce the resistance of the cortical bone and accelerate tooth movements. It was first tried in orthodontics by Kole[29], where tooth movements were achieved between 6 and 12 months.

In 2001 Wilcko reported that the acceleration

of tooth movement is not due to the bony block movement as postulated by Kole[29] it was rather a process of bone remodeling at the surgical site, which was called regional acceleratory phenomenon (RAP). He developed patent techniques which were called accelerated osteogenic orthodontics (AOO) and periodontal accelerated osteogenic orthodontics. Also, modification of RAP was done by adding bio-absorbable grafting material over the injured bone to enhance healing.

This technique is reported to have postoperative stability and improved retention but more studies are still needed to be done. The negativity of these surgical techniques is their invasiveness and the acceleration was only in the first 3 to 4 months and it declines with time to the same level of the controls, as shown by others.

Piezocision technique

One of the latest techniques in accelerating tooth movement is the Piezocision technique. Dibart[30] was among the first to apply the Piezocision technique which starts with primary incision placed on the buccal gingiva followed by incisions by Piezo surgical knife to the buccal cortex. Piezocision technique did not cause any periodontal damage. Another benefit of this technique is that it can be used with Invisalign, which leads to a better aesthetic appearance and less treatment time.

Clinical application for the future

The administration of exogenous biological molecules to accelerate tooth movement during orthodontic treatments has been intensively tested on animal experiments. However, clinical trials on humans are limited since they must be administered occasionally by local injections that can be painful and cause discomfort to the patients avoiding systemic applications, plus their side effect was not tested for long periods of time. However, administration of certain molecules has shown promising results; for example, cytokine, PTH, vitamin D, and RANKL/RANK/OPG system play an important role in bone remodeling and tooth movement. Human relaxin does not accelerate tooth movement in rats, but increases tooth mobility by decreasing the organization and mechanical strength of the PDL. However, a lot ofthese mechanisms are not fully understood and the dose-dependent mechanisms should also be further investigated.

In the physical approach, the low level laser therapy is the most promising method; however, contradictory results were shown. This is due to the different energies, duration, and experimental design. Furthermore, most of these experiments were done in only few weeks, which is a very short time to notice any side effects.

The surgical approach is the most clinically used and most tested with known predictions and stable results. However, it is invasive, aggressive, and costly, and patients are not open to the ideas involving surgery unless it is the only option that is needed to have a good occlusion. Piezocision technique is one of the newest techniques in accelerating tooth movement, and it has good clinical outcome and is considered the least invasive in the surgical approach.

Conclusions

In general, all these techniques had draw backs and uncertainties that made them not commonly used clinically. However, there has been a rapid increase in the interest levels of product companies to enhance the effects of biology in orthodontics. These new approaches have the potential to be the next frontier for orthodontics and its resources.

References

1. Davidovitch Z. Tooth movement. Crit Rev Oral Biol Med. 1991; 2(4):411–50.
2. Meikle MC. The tissue, cellular, and molecular regulation of orthodontic tooth movement: 100 years after Carl Sandstedt. Eur J Orthod. 2006; 28(3):221–40.
3. Davidovitch Z, Nicolay OF, Ngan PW, Shanfeld JL. Neurotransmitters, cytokines, and the control of alveolar bone remodeling in orthodontics. Dent Clin North Am. 1988; 32(3):411–35.
4. Krishnan V, Davidovitch Z. Cellular, molecular, and tissue-level reactions to orthodontic force. Am J Orthod Dentofacial Orthop. 2006; 129(4):469. e461-432.
5. Burstone CJ, Tanne K. Biomechanical basis

of tooth movement. Nippon KyoseiShikaGakkaiZasshi. 1986; 45(4):541–51.

6. Garlet TP, Coelho U, Silva JS, Garlet GP. Cytokine expression pattern in compression and tension sides of the periodontal ligament during orthodontic tooth movement in humans. Eur J Oral Sci. 2007; 115(5):355–62.

7. Leiker BJ, Nanda RS, Currier GF, Howes RI, Sinha PK.The effects of exogenous prostaglandins on orthodontic tooth movement in rats.Am J Orthod Dentofacial Orthop. 1995; 108(4):380–8.

8. Krishnan V, Davidovitch Z. The effect of drugs on orthodontic tooth movement.OrthodCraniofac Res. 2006; 9(4):163–71.

9. Saito M, Saito S, Ngan PW, Shanfeld J, Davidovitch Z. Interleukin 1 beta and prostaglandin E are involved in the response of periodontal cells to Nimeri et al. Progress in Orthodontics 2013, 14:42 http://www.progressinorthodontics.com/content/14/1/42mechanical stress in vivo and in vitro. Am J Orthod Dentofacial Orthop.1991; 99(3):226–40.

10. Yamasaki K, Miura F, Suda T. Prostaglandin as a mediator of bone resorption induced by experimental tooth movement in rats. J Dent Res. 1980; 59(10):1635–42.

11. Yamasaki K, Shibata Y, Fukuhara T. The effect of prostaglandins on experimental tooth movement in monkeys (Macacafuscata). J Dent Res. 1982; 61(12):1444–6.

12. Yamasaki K, Shibata Y, Imai S, Tani Y, Shibasaki Y, Fukuhara T. Clinical application of prostaglandin E1 (PGE1) upon orthodontic tooth movement. Am J Orthod. 1984; 85(6):508–18.

13. Seifi M, Eslami B, Saffar AS. The effect of prostaglandin E2 and calcium gluconate on orthodontic tooth movement and root resorption in rats.Eur J Orthod. 2003; 25(2):199–204.

14. Kanzaki H, Chiba M, Arai K, Takahashi I, Haruyama N, Nishimura M, Mitani H.

Local RANKL gene transfer to the periodontal tissue accelerates orthodontic tooth movement. Gene Ther. 2006; 13(8):678–85.

15. Nishijima Y, Yamaguchi M, Kojima T, Aihara N, Nakajima R, Kasai K. Levels of RANKL and OPG in gingival crevicular fluid during orthodontic tooth movement and effect of compression force on releases from periodontal ligament cells in vitro. OrthodCraniofac Res. 2006; 9(2):63–70.

16. Collins MK, Sinclair PM. The local use of vitamin D to increase the rate of orthodontic tooth movement.Am J Orthod Dentofacial Orthop. 1988; 94(4):278–84.

17. Kale S, Kocadereli I, Atilla P, Asan E. Comparison of the effects of 1,25 dihydroxycholecalciferol and prostaglandin E2 on orthodontic tooth movement. Am J Orthod Dentofacial Orthop. 2004; 125(5):607–14.

18. Soma S, Iwamoto M, Higuchi Y, Kurisu K. Effects of continuous infusion of PTH on experimental tooth movement in rats. J Bone Miner Res. 1999; 14(4):546–54.

19. Soma S, Matsumoto S, Higuchi Y, Takano-Yamamoto T, Yamashita K, Kurisu K, Iwamoto M. Local and chronic application of PTH accelerates tooth movement in rats. J Dent Res. 2000; 79(9):1717–24.

20. Liu ZJ, King GJ, Gu GM, Shin JY, Stewart DR. Does human relaxin accelerate orthodontic tooth movement in rats? Ann N Y Acad Sci. 2005; 1041:388–94.

21. Davidovitch Z, Finkelson MD, Steigman S, Shanfeld JL, Montgomery PC, Korostoff E. Electric currents, bone remodeling, and orthodontic tooth movement. II. Increase in rate of tooth movement and periodontal cyclic nucleotide levels by combined force and electric current. Am J Orthod. 1980; 77(1):33–47.

22. Liou EJ, Huang CS. Rapid canine retraction through distraction of the periodontal ligament. Am J Orthod Dentofacial Orthop. 1998; 114(4):372–82.

23. Baloul SS, Gerstenfeld LC, Morgan EF, Carvalho RS, Van-Dyke TE, Kantarci A.

Mechanism of action and morphologic changes in the alveolar bone in response to selective alveolar decortication-facilitated tooth movement.Am J Orthod Dentofacial Orthop. 2011; 139(4 Suppl):S83–101.

24. Aboul-Ela SM, El-Beialy AR, El-Sayed KM, Selim EM, El-Mangoury NH, Mostafa YA. Miniscrew implant-supported maxillary canine retraction with and without corticotomy-facilitated orthodontics.Am J Orthod Dentofacial Orthop. 2011; 139(2):252–9.

25. Han XL, Meng Y, Kang N, Lv T, Bai D. Expression of osteocalcin during surgically assisted rapid orthodontic tooth movement in beagle dogs. J Oral Maxillofac Surg. 2008; 66(12):2467–75.

26. Dibart S, Surmenian J, Sebaoun JD, Montesani L. Rapid treatment of Class II malocclusion with piezocision: two case reports. Int J Periodontics Restorative Dent. 2010; 30(5):487–93.

27. Keser EI, Dibart S. Piezocision-assisted Invisalign treatment. CompendContinEduc Dent. 2011; 32(2):46–8. 50–41.

28. Wang L, Lee W, Lei DL, Liu YP, Yamashita DD, Yen SL. Tisssue responses in corticotomy- and osteotomy-assisted tooth movements in rats: histology and immunostaining. Am J Orthod Dentofacial Orthop. 2009; 136(6):770. e771-711; discussion 770–771.

29. Kole H. Surgical operations on the alveolar ridge to correct occlusal abnormalities.Oral Surg Oral Med Oral Pathol. 1959; 12(5):515–29. concl.

30. Dibart, Mittal SKS, Singla A. Piezocision assisted orthodontics: a new approach to accelerated orthodontic tooth movement. Innovative Dentistry.2011; 1:1.

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REVIEW

Oral submucous fibrosis: A clinical review

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Abstract

Oral submucous fibrosis (OSMF) is a chronic disease affecting any part of the oral cavity. Epithelial atrophy, juxta-epithelial inflammation and fibrosis of the lamina propria are common findings. In this review we discuss various components of OSMF, including the classification, aetiology, clinical presentation, pathogenesis, and a brief overview of its management.

Keywords: Oral submucous fibrosis; Aetiology; Clinical presentation; Pathogenesis; Management; Review

Introduction

Oral submucous fibrosis (OSMF) is a chronic, insidious, disabling disease involving oral mucosa, the oropharynx, and, rarely, the larynx. It has been reported mainly in the Indian population, having been established in the Indian literature since the time of Sushruta. [1]The definition by the World Health Organization (WHO) of a precancerous oral condition: "a generalized pathological state of the oral mucosa associated with significantly increased risk of cancer" correlates well with the characteristics of OSMF.[2,3]

Pindborg and Sirsat[3] gave a definition, as one of an insidious, chronic disease that affects any part of the oral cavity and sometimes the pharynx. Although occasionally preceded by, or associated with, formation of vesicles, it is always associated with a juxtaepithelial inflammatory reaction followed by fibroelastic change of the lamina propria and epithelial atrophy that leads to stiffness of the oral mucosa and causes trismus and an inability to eat.[1] This is one of the most widely accepted definition of the disease.

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In 1952, Schwartz proposed the term "atrophia idiopathies (tropica) mucosae oris" for this disease when he described the condition in 5 Indian women. The term "submucous fibrosis of the palate and pillars" were coined by Joshi.[4] Other terminologies suggested include "diffuse oral submucous fibrosis", "idiopathic scleroderma of the mouth", "idiopathic palatal fibrosis", and "sclerosing stomatitis".[2,3] Paymaster in 1956[5] first described its premalignant nature. The term "submucous fibrosis" was used by Pindborg and Sirsat although they suggested that a more appropriate name would be "juxtaepithelial fibrosis".[1] Ramnathan called it an Asian analog of sideropenic dysphagia, when he suggested that OSMF may be a mucosal change secondary to chronic iron deficiency[3].

Classification

Various classification and staging systems have been mentioned in literature.[6] Pindborg and Sirsat[1] in 1966 proposed one of the earliest classification based on histopathological features and was later updated by Utsunomiya et al[7] in 2005. The classification did not give any description of the epithelial component of the disease.[6] Wahi et al.[8] presented the first clinical classification based on symptoms, and since then several others proposed different classifications. Khanna and Andrade[9] have successfully combined histopathological and clinical features of the disease, and proposed a staging mainly to aid in surgical management.

Aetiology

The condition is thought to be multifactorial in origin; studies have shown that areca-nut is the main aetiological factor in OSMF[13]. Various auto antibodies and specific human leucocyte antigens (HLA) in some patients have indicated an autoimmune role as well as a genetic predisposition for the disease.[13] Other possible aetiological factors include hypersensitivity , capsaicin in chillies, malnutrion, iron, zinc, and deficiencies in essential vitamins.[11,12]

Clinical presentation

The disease can be classified clinically into two phases: An eruptive phase and the fibrosis induction phase. These two phases appear in a cyclic manner. Initially, most patients present with a burning sensation or intolerance to spicy food, and they may have vesicles, particularly on the palate. Ulceration and dryness of the mouth is later followed by fibrosis of the oral mucosa, which leads to rigidity of the lips, tongue, and palate, and trismus.[12] Petechiae occur most often on the tongue followed by the labial and buccal mucosa.[2,14]A useful clinical sign is pain on palpation in the sites where submucosal fibrotic bands are developing,[14] and trismus is caused mostly by fibrosis in the dense tissue around the pterygomandibular raphae.[14] In advanced stages the patients may experience referred pain to ear,dysphagia[14,15] due to fibrosis involving nasopharynx or oesophagus and even ,deafness due to fibrosis of Eustachian tube[15,16].

Palpable fibrous bands with blanched, opaque oral mucosa [10,13,14] is the most identifying clinical signs Furthermore, the overlying epithelium may become dysplastic and malignant. Restricted mouth opening interferes with examination of the oral mucosa, and makes early diagnosis of cancer a difficult task.[10, 15–17]

Pathogenesis

Although various factors and theories have been put forth to explain the pathogenesis of OSMF, nothing is fully conclusive. Studies have shown areca-nut to play a key primary role in the development of OSMF.

It contains alkaloids, flavonoids, and copper, which all interfere with homeostasis of the extracellular matrix. Four alkaloids:arecoline , arecaidine, guvacine, and guvacoline are known to stimulate fibroblasts to produce collagen.[10] Flavonoids like tannins and catechins inhibit collagenase, stabilise the collagen fibrils, and render them resistant to degradation by collagenase.[10, 13] The localised mucosal inflammation caused results in the recruitment of activated T-cells and macrophages that lead to an increase in cytokines and tumour growth factor beta (TGF- â).[15] The latter considerably increases the production of collagen by activating procollagen genes, and upregulating procollagen proteinase enzymes and lysyl oxidase activity.[7,36] Simultaneously, TGF-â inhibits collagen degradation by activating the tissue inhibitor of matrix metalloproteinase (TIMP) genes and plasminogen activator inhibitor (PAI).[15] The high concentration of copper in areca-nut has been found to stimulate lysyl oxidase activity, an enzyme essential to the final cross-linking of collagen fibres.[15]Increased copper has been seen in mucosa affected by OSMF, which supports its role in fibrogenesis by enhancing lysyl oxidase activity.[10] Continually chewing areca-nut leads to increased activity of the masticatory muscles, depletion of glycogen, and muscle fatigue. The reduced blood supply following fibro-sis further promotes muscle fatigue and causes extensive degeneration and fibrosis in the muscles.[9]

Two other possible concurrent mechanisms to explain the pathogenesis of OSMF are autoimmune factors and genetic predisposition.[13] This has been substantiated by the presence of circulating immune complexes, immunoglobulins and autoantibodies in some patients with OSMF, as well as altered cellular and humoral responses.[10,13] Genetic susceptibility is supported by raised HLA-A10, -B7, and DR3 in OSMF patients compared with normal controls.[14] The familial occurrence of the disease has been reported from India and South Africa.[10,13] It seems likely that OSMF is a multifactorial disease with initiators, promoters, and other modifying cofactors. The loss of equilibrium of extracellular matrix and continuous deposition of extracellular matrix in OSMF is currently well accepted.[13]

Management

The various treatment options for the management of OSMF can be grouped under

following headings: surgical, physical, and medical treatments. Medical treatment includes dietary supplements such as vitamins and antioxidants, the use of anti-inflammatory drugs mainly corticosteroids, use of proteolytic agents such as hyaluronidase, anticytokines have been given orally ,topically or by submucosal injections.[17,18] Physical treatment measures aimed to influence the remodelling of tissue by using movement include exercises and physiotherapy, various splints or other devices to improve mouth opening, or localised heat such as with microwave diathermy [19,20]. Kerr et al.[18] recently hypothesised that cessation of the habit alone may have a considerable effect more on the symptoms of OSMF than on reversing fibrosis.

Surgical treatment, used mainly to manage trismus, involves incising and releasing the fibrotic areas, and leads to further scarring and fibrosis. The introduction of pedicled tissue, such as a buccal fat pad, nasolabial or platysmal flaps, or free tissue transfer in an attempt to release fibrosis [19, 20] is one approach but results are variable. Physical treatment measures combined with other interventions are usually used for treating OSMF and surgery is reserved only for established cases.

Conclusion

OSMF is a debilitating but preventable disease and considering the malignant potential of the diseases, early diagnosis and proper management is essential in reducing the mortality of oral cancer.

Reference

1. Pindborg JJ, Sirsat SM. Oral submucous fibrosis. Oral Surg Oral MedOral Pathol 1966;22:764–79
2. Rajendran R. Oral submucous fibrosis: etiology, pathogenesis, and future research. Bull World Health Organ 1994;72:985–96.
3. World Health, Organization. Guide to epidemiology and diagnosis oforal mucosal diseases and conditions. Community Dent Oral Epidemiol1980;8:1–26.
4. Joshi SG. Submucous fibrosis of the palate and pillars. Indian J Otolaryng1953;4:1–4.
5. Paymaster JC. Cancer of the buccal mucosa; a clinical study of 650 casesin Indian patients. Cancer 1956;9:431–5.
6. Ranganathan K, Mishra G. An overview of classification schemes fororal submucous fibrosis. J Oral Maxillofac Pathol 2006;10:55–8.
7. Utsunomiya H, Tilakaratne WM, Oshiro K, et al. Extracellular matrixremodeling in oral submucous fibrosis: its stage-specific modes revealedby immunohistochemistry and in situ hybridization. J Oral Pathol Med2005;34:498–507
8. Wahi PN, Luthra UK, Kapur VL. Submucous fibrosis of the oral cavity.Histomorphological studies. Br J Cancer 1966;20:676–87.
9. Khanna JN, Andrade NN. Oral submucous fibrosis: a new concept insurgical management. Report of 100 cases. Int J Oral Maxillofac Surg1995;24:433–9.
10. Tilakaratne WM, Klinikowski MF, Saku T, Peters TJ, WarnakulasuriyaS. Oral submucous fibrosis: review on aetiology and pathogenesis. OralOncol 2006;42:561–8.
11. Warnakulasuriya KA, Trivedy C, Maher R, Johnson NW. Aetiology oforal submucous fibrosis. Oral Dis 1997;3:286–7.
12. Sinor PN, Gupta PC, Murti PR, et al. A case control study of oral sub-mucous fibrosis with special reference to the etiologic role of areca nut.J Oral Pathol Med 1990;19:94–8.
13. Angadi PV, Rao SS. Areca nut in pathogenesis of oral submucous fibrosis:revisited. Oral Maxillofac Surg 2011;15:1–9.11.
14. Rajendran R. Oral submucous fibrosis. J Oral Maxillofac Pathol2003;7:1–4.
15. Aziz SR. Oral submucous fibrosis: case report and review of diagnosisand treatment. J Oral Maxillofac Surg 2008;66:2386–9.
16. Pindborg JJ. Oral submucous fibrosis: a review. Ann Acad Med Singapore1989;18:603–7.
17. Lai DR, Chen HR, Lin LM, Huang YL, Tsai CC. Clinical evaluationof different treatment methods for oral submucous fibrosis. A 10-

yearexperience with 150 cases. J Oral Pathol Med 1995;24:402–6.

18. Kerr AR, Warnakulasuriya S, Mighell AJ, et al. A systematic review ofmedical interventions for oral submucous fibrosis and future researchopportunities. Oral Dis 2011; 17 (Suppl.1) : 42–57.

19. Huang JJ, Wallace C, Lin JY, et al. Two small flaps from one anterolateralthigh donor site for bilateral buccal mucosa reconstruction after releaseof submucous fibrosis and/or contracture. J Plast Reconstr Aesthet Surg2010;63:440–5

20. Wei FC, Chang YM, Kildal M, Tsang WS, Chen HC. Bilateral small radial forearm flaps for the reconstruction of buccal mucosa after surgicalrelease of submucosal fibrosis: a new, reliable approach. Plast ReconstrSurg 2001;107:1679–83.

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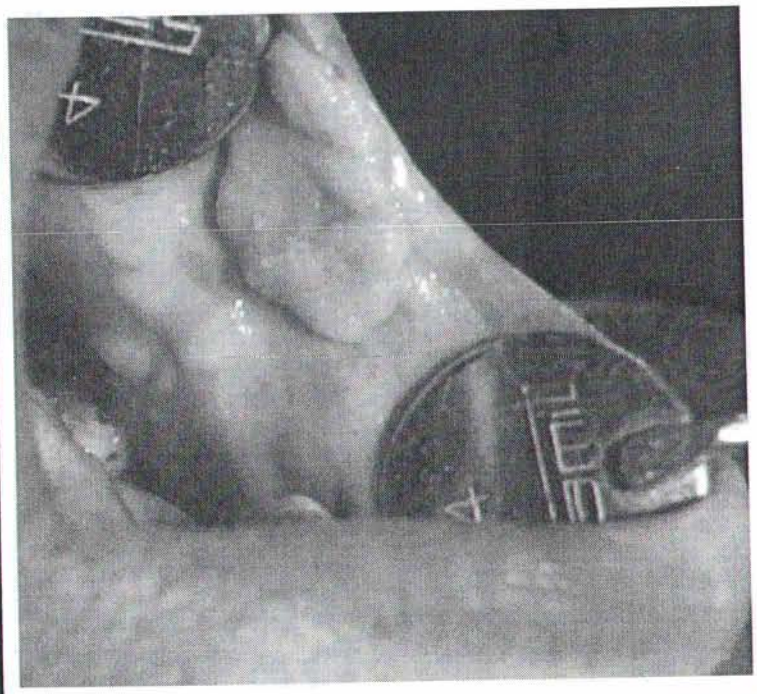

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