History of Prosthodontics - *Part II*

00 AD - 1500 A.D.

Dentistry is defined as the profession that cares for, repairs and replaces missing teeth and other tissue by bridges and prostheses and treats dental abnormalities, disease, traumatic injuries and also provides preventive measures for caries and periodontal diseases.

Dental historians like those for many other arts describe little progress in dental art from the beginning of the Christian era to about 1500 A.D. During this period little progress was made in any of the sciences. This was noted as the period of retrogression or 'dark age'. Though many activities may not have been recorded or may have been destroyed through acts of superstition or religious fanaticism, the chief contribution to dentistry of this period was a shift from prosthetics to restoration of carious teeth. The invention of press in 1436 aided in dissemination of knowledge dental books and writing were published. One of the first books to treat dentistry independently of medicine was written in German in 1548 by Walter Herman Ryte.

1600 - 1840

BEGINNING OF DENTAL SCIENCES

Little progress was made in dentistry until 18th century. The pace of advancement doubled in 18th century, when immortal Pierre Fauchard wrote in 'LE CHIRUGEIN DENTISTE' and documented works of dentists.

WHO also established dentistry as a true profession. The field was now based on sound rationales and scientific bases and with no superstition or ignorance.

Tooth transplantation created immense interest in dental world. Artificial replacement by teeth of tiger to be brave like a tiger became popular. Replacement & ivory teeth and bone were generally unsatisfactory because they absorbed odour and become discoloured.

In 18th century Johen Hunter argued the advantage of transplanting teeth of a living human directly in jaw of another human. He made what to us today seems an awesome recommendation that dentist have several donors in attendance when transplanting teeth. If the 1st tooth didn't fit the socket then one from the next person was to be tried until proper fit was achieved.

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Transplantation died out in time after repeated failures had been publicized and risk of transmitting disease had been recognized. After this mineral teeth had been introduced.

Alex Duchateau a Persian in around 1740 found that his own ivory denture became stained and malodorous. Seeking a solution he attempted to make denture from porcelain. He teamed up with a Persian dentist Nicholas Dubious de Chemant & published his article 'a dissertation on artificial teeth in 1797' this got him a royal patent from Louis the 16th.

In 1788 Nicholas Dubois de Chémant (*Fig. 1*) who was originally a French man left for England to escape French revolution wrote a book in English describing Porcelain. He prepared his own denture and termed it as 'Mineral paste teeth' or Incorruptible which was for many years synonymous with porcelain teeth. His dentures remained popular until the introduction of individually baked Porcelain teeth.

In 1808 Giuseppangelo Fonzi (*Fig. 2*) presented 'Terro metallic incorruptible' Fonzi created moulds in which he constructed individual porcelain teeth. Before firing a pin of platinum was embedded in the back of each teeth and this pin was later on soldered to gold or silver denture bases. Fonzi created dentistry with preparing 26 shades of porcelain by use of metallic oxides.

By 1825 porcelain teeth were being produced and improved in America. In 1844 S.S White invested in production of porcelain teeth and their improvement in colour and S.S White became a leading dental manufacturer. Records indicate that Ney & White companies are among the oldest in the trade at present time. By 1840 the field of dentistry had reached a definite turning point The 1st National Dental Society was established and 1st Dental Journal of the world published. The American Journal of the dental sciences - 1839.

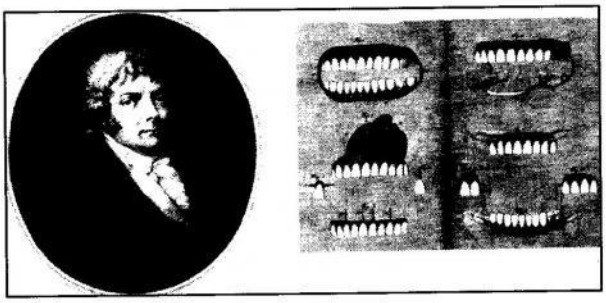

Fig. 1 : *Nicolas Dubois de Chémant : Porcelain dentures and an obturator in the English flyer "A Dissertation on Artificial Teeth", 1797.*

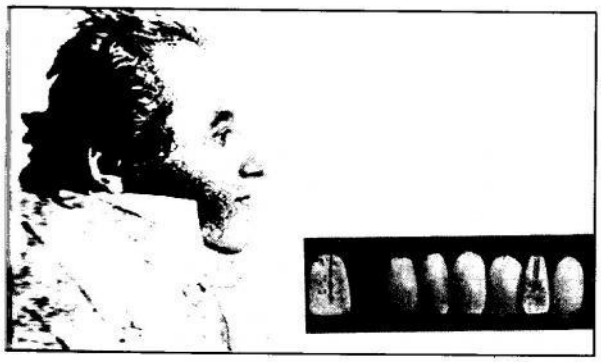

Fig. 2 : *Giuseppangelo Fonzi, Dents terro-métalliques*

Period of mechanical improvement 1840-1900.

Dentistry like the allied arts and sciences took full advantage of mechanical developments of the last 20 centuries. During this period applied mechanics was recognized as an essential supplement to biological principles of dentistry.

After 1840, America began to acquire leadership in creating and introducing materials in restorative dentistry and a substantial industry was developed in this period.

Charles Land in 1889 introduced furnaces using gas or gasoline for backing porcelain jacket crown and high fusing inlays. Levitt Euster (1894) introduced the electric furnace for porcelain. W.E. Christensen introduced high fusing porcelain inlays in 1985. E.B. Splading (1903) described a gingival shoulder for the porcelain jacket crown.

Thus dentistry got established as a science and industrial development had a definite impact on dentistry.

The future issues of the journal would deal with the history of materials and methods in prosthodontics in particular.

Letter

Dear Madam,

Please accept my compliments for face lifting the cover page of our soc. Journal. I know the efforts that has gone in to it.

Articles were nice but if you give a thought it was almost a C.D. issue. As a practitioner I wish to see more articles on FPD & current dental materials.

I wish all the best,

Dr. S.M. Karbelkar
Practising Prosthodontist
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Clinical Assessment of Shock Absorption with Various Thicknesses of Heat Cure Silicon Soft Denture Liner

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INTRODUCTION

There is a pressing need to fill some of the lacunae that remain in the successful attainment of the fundamental objectives of prosthodontic treatment. All possible methods should be under taken to ensure continued tissue health by minimizing the potential traumatic effects in a complete denture wearer.

As denture bases are made of rigid material, a considerable number of denture users/wearers suffer from chronic soreness. The soft denture bearing mucosa is confined between hard denture base and underlying basal seat, and during normal function damage can be done to the tissue.

Human body has many regions for shock absorption such as periodontal membranes, elastic muscle in abdominal wall, spongy layers of the epiphysis of long bone and diagonal fibers of Masseter muscle[1].

The same aforesaid principle was proposed to be used in dentures. There was always the need for the material which could be used with the denture base so that it could act to permit a wide dispersion of forces, and result in lower force per unit area being transmitted to the supporting tissue. It could increase the thickness of the oral tissue by serving as an analog of mucoperiosteum and provide a cushion to denture bearing mucosa. Further, it could also reduce residual ridge reduction by decreasing the impact force in load bearing structure during function[2,3].

In the present study, shock absorbing capacity of different thicknesses of heat cure silicon (Molloplast B) soft denture liner was evaluated. Mandibular dentures of edentulous patients were used. Measurements were done using airpressure - PC based data acquisition, during normal chewing movements.

This study aims to find out shock absorbing capacity of different thicknesses of heat cure silicon soft liner. The objective of this study is to evaluate the amount of shock absorbed during mastication between the occlusal table and mucosal surface - denture based interface clinically.

Keywords : *Vertical dimension of occlusion, Mandibular rest position, Electromyography, Occlusal rehabilitation.*

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MATERIAL AND METHODS

Sample

The study was carried out on a sample of 11 patients. Edentulous patients attending hospital outdoor were considered as unit of inquiry. Personal, medical and dental history of all patients were recorded, the detailed examination of oral cavities were done. The patients not fulfilling the general criteria for selection were not considered.

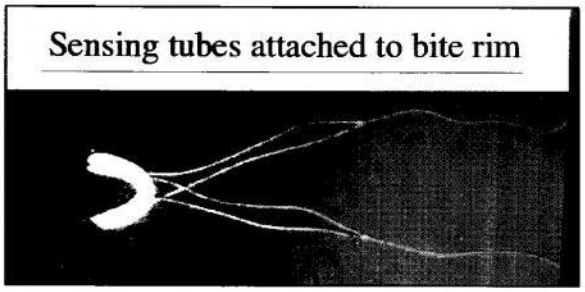

Fig. 1 : *Mandibular bite block with 'Y' shaped rubber tubing of pressure transducer*

Material and Equipment

Heat cure silicon soft liner, heat cure polymethymethacrylate, shellac base plate were used. Heat cure polymethylmethacrylate was used for making bite blocks. Shellac base plate for making spaces of 1, 2, 3 mm thickness, and heat cure silicon soft liner as lining material were used[4,5,6,7]. Hanau semi-adjustable articulator, acrylizer, 'Y' shaped pressure sensing tube, specially designed pressure transducer and personal computer based data acquisition system were used[8,9,10,11].

Pressure transducer : A silicon piezo-resistive pressure sensor was used as a pressure transducer. It provides highly accurate and linear voltage output-directing proportional to the applied pressure. The sensor is a single monolithic silicon diaphragm, with the strain gauge and a thin film resistor network integrated onchip. The chip is laser trimmed for precise span and offset calibration and temperature compensation. It is also ratiometric to power supply voltage. Output is directly proportional to the differential pressure and is essentially a straight line. Output of pressure transducer was amplified by AD524a precision monolithic instrumentation amplifier giving high accuracy under worst operating conditions.

PERSONAL COMPUTER BASED DATA ACQUISITION SYSTEM

Data acquisition system was built around PCL-812 data acquisition card fitted in IBM PC. Analog output signal from pressure transducer was digitized at 12 bit resolution. ± 1 bit accuracy and ± 1 bit linearity. This digital value was read by the software.

Pressures at occlusal table, under the mandibular dentures and their difference were displayed graphically on the computer screen in real time. Person name, linear thickness. data set, data and time information was saved along with the pressure data. All the information was saved in a plain ASCII text file and data was analyzed later.

PROCEDURE

One maxillary and four mandibular bite blocks of heat cure acrylic with soft liner of 0, 1, 2, 3 mm thickness were prepared by conventional method at same occlusal vertical dimension. Holes were made wih carbide bur, through and through, in all mandibular bite blocks on buccal flanges at canine region. After examination 'Y' shaped rubber tubing marked 'upper' were attached to the occlusal table of mandibular bite block and was placed in centre bucco-lingually, and tubing marked 'lower' was inserted in the hole and sealed in such a way so that it rests between the bite block base and mucosal surface. Terminal ends of tubing under the bite blocks were inserted in a hole made in bite block at retromolar pad area to prevent impingement of these ends on the soft mucosa. The third end of the 'Y' shaped tubing was attached to the pressure transducer which displayed the pressure exerted during masticatory movement on PC screen graphically. The data acquisition system recorded the masticatory force in terms of pressure in M-bars. Relationship between recorded pressure and exerted force was determined by loading pre-determined length of rubber tubing with standard-weights and recording indicated pressure.

The patients were asked to sit on a chair in an upright position, looking straight ahead with back well supported and head unsupported. Maxillary bite rim was inserted in the patient's mouth and checked for stability and retention. The mandibular bite rim attached with tubing was inserted in patient's mouth. It was made sure that the tubing at occlusal table in the center of the rim buccolingually and touches the rim antero-posteriority. The tubing under the rim did not impinge in soft tissue.

Now the patients were asked to perform the act of mastication with the bite rims. The force exerted by the patient at the occlusal table was transmitted to the ridge, and their difference was displayed on the PC screen graphically and was stored by pressing a key. The above procedure was repeated for 1, 2, 3 mm thickness of soft liner and similar procedure repeated in all 11 patients.

RESULTS

The pressure exerted by the patient on occlusal table ranges from 4-25 kg (i.e. from 965-985 bars). On analysis, it was found that there is highly insignificant rise in relative shock absorption between 2.0 mm thickness vs 1.0 mm thickness of soft liner ($t=0.1535$, $p>>0.10$). It was further concluded on comparing 3.0 mm vs 2.0 mm thickness of soft liner that relative shock absorption was highly significant ($t=3.243$, $P<<0.005$). From the above results it can be concluded that the material i.e. Molloplast B does certainly help in increasing the relative shock absorption, but it is relatively ineffective upto 2 mm thickness. It was further observed that the total shock absorption between 3.1 mm thickness of soft liner was insignificant ($t = 2.0506$, $P < 0.05$). There was an insignificant total shock absorption between 3.2 mm thickness of soft liner ($t = 1.486$, $P > 0.05$). There was further insignificant total shock absorption between 3.1 mm thickness ($t = 1.695$, $P > 0.05$).

DISCUSSION

All masticatory forces are stress forces and lead to resorption of the residual ridge. Since age, the thought has been growing on to develop such a material that would be ideal with such forces and act as stress breaker or absorber and prevent the direct impact on the residual ridge[12,13].

Soft liners may affect the forces of perception during mastication, so the thickness of the liner is an important criteria. Hence this study was undertaken to assess the shock absorption by various thicknesses of soft denture liner.

The occlusal forces were measured by sound transmission, by hydraulic pressure system, and telemetry[9,16,17]. But no thought was given to measure the forces by developing an air transducer - PC based Data Acquisition System. In the study, the masticatory pressure (force) in a patient was measured at occlusal table and at the mucosal surface denture base interface simultaneously.

It was found that even the acrylic bite rims could act as shock absorption similarly as rims with 1 and 2 mm of liner and even if no soft liner is used, still some amount of shock has been absorbed by the acrylic rims. This is attributed to the resilience of an underlying mucosa and also to the negligible resilience of acrylic resin as no material is 100% hard.

In relation to the different thickness of soft liner, it was found that the increase in relative shock absorption 2-0 vs 1-0 is insignificant, which signifies that using 0 thickness or 1 mm thickness does not have a relevant difference in shock absorption capacity. The increase of the shock absorption was better between 2 mm and 3 mm thickness of soft liner. But maximum relative shock absorption was at 3 mm thickness as compared to 0, 1 and 2 mm thickness; this also supports the work of Parker and Karvane et al. They concluded that soft liners were found to reduce the impact force when compared with denture base resin, and 2 and 1 mm layer of soft denture material demonstrated good shock absorption[1,4].

The result of total shock absorption is 3-0, 3-1 and 3-2 with $\mu=0$, reveals altogether a different pattern and were subjected to quite in-depth rethought on the nature of material which discloses that as the thickness of soft liner increases though the amount of relative shock ab-

sorption also increases, but it is subjected to greater amount of variation. This greater amount of variation offset any nominally observed increase in relative shock absorption. The reason needs a serious attention, whether the material is showing uniformly consistent behaviour during work conditions or not.

Our conclusions are supported in light of the graph, which clearly shows a sudden steep rise in the relative shock absorption, but when we draw two horizontal lines from 0 thickness, we observed that overall increase is on the higher side, which is probably due to large amount of masticatory force exerted by patient.

It implies that with the increase in thickness, the capacity of liner to absorb shock during mastication increases, but consistent behaviour of the material should be studied by taking large number of samples in future.

CONCLUSION

In the present study, the following conclusions are derived regarding the shock absorption of soft liner. The data related to shock absorption confirms that even acrylic resin bite rims were able to absorb certain amount of shock. The shock absorbed by the soft liner of different thickness is highly significant at 3 mm thickness. The total shock absorption discloses that as the thickness of soft liner increases, there is increase in the shock absorbing capacity, but with a greater standard deviation and that the force exerted by the patient at the occlusal table ranges from 966-985 m bars, i.e. 4-25 kg. With the increase in thickness of the liner, the patient is able to exert more force on occlusal table, but there is proportionate decrease in the impact force transmitted to the ridge.

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Abstract

A screw lock for single tooth implant superstructures

The most common complication in a single tooth implant restoration is abutment screw loosening. Instability of the prosthetic superstructure is expressed by difficulty in chewing and functioning as well as soft tissue soreness and/or swelling that could lead to screw fracture. Manufacturers of oral implants have attempted to refine the connecting parts of the prosthesis to achieve a more predictable tightening method for the screws.

The authors have developed a technique in which an elongated hexagonal titanium bar is inserted into the hexed fixed screw head. The screw is locked, and the bar is then fixed with a light cure composite resin material that serves to seal the retaining screw access hole. The occlusal hexagonal bar thus serves as a secure screw lock that can be easily removed if needed.

ZVI, Artzi, DMD, Arie Dreiangel, D.M.D.

JADA, May, 1999; Vol. 130, No. 5; Pg. 677

A Comparitive Analysis of The Relation Between Clinical and Electromyographic Rest Position in Normal Dentate Patients and Patients with a Reduced Vertical Dimension

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ABSTRACT

The determination of the correct vertical dimension of occlusion is a critical procedure in clinical dentistry during oral reconstructive procedures. Alteration of the vertical dimension beyond tolerable limits can affect esthetics, induce speech difficulties and cause muscle discomfort. In dentate patient with a loss of vertical dimension due to excessive attrition of teeth, determination of mandibular rest position accurately becomes difficult and unreliable. Hence the use of a sophisticated device like the electromyograph is used to supplement clinical judgement.

In this study, vertical dimension was determined clinically by conventional methods and an electromyograph unit was used to measure electrical activity of masticatory muscles. It was found that the minimal electrical activity of the masseter and the anterior temporalis along with biofeedback was 4.90 and 5.96 mm caudal to the rest position determined clinically. Minimal activity was seen to occur over a range of 6-8 mm . The difference between the Electromyographic and clinical rest position was always constant at 6.51 mm (± 0.6mm) This value can be used accurately in patients whose vertical dimension is reduced and is to be restored; by subtracting it from the Electromyographically determined rest position.

INTRODUCTION

Over the years science has been witness to tides of ideologies lashing against each other. Some of these fade into oblivion while others develop into so called world wide acceptable concepts. Let us sketch the development of one such concept , that is the vertical dimension.

Clinical measurements of the vertical dimension of occlusion rely upon the determination of the mandibular rest position and hence it is not surprising that its assessment has been subject to many investigations in the past. There cannot be any reference to the rest position without describing the elevators and depressors of the mandible. These have been described as

- in equilibrium in tonic contraction : (Acad. of Denture Pros. -1956)
- in minimal tonic contraction : (Ramfjord and Ash - 1971)[1]
- in reciprocal coordination : (Sweitzer)[2]
- in relaxed position : (British Standards Inst. - 1983)

Thus the role of muscles might range from "passive" (Yemm and Berry)[3] to "active" (Moller)

Recognition of the importance of the mandibular rest position is not something new. It has been hotly debated over the years.

Authors like Hunter (1771), Wallisch (1906), Sicher (1920) and particularly Niswonger (1934)[2] have stated that the mandibular rest position remains constant throughout life. Thompson has stated that the position of the mandible with relation to the head is determined three months post- natal , long before the teeth erupt , and it remains constant throughout life.

In opposition to this view, Leof, Atwood, Tallgren[5] have stated that the rest position constantly changes and may be variable for the same patient in between sittings and also the same sitting.

It is thus evident that the mandibular rest position is an entity surrounded by an aura of uncertainty and always trapped between two conflicting concepts. To compound the problem it is also a well established fact that the determination of the rest position is extremely subjective and dependent on the clinical judgement of the operator. At the same time of the day for the same patient different operators can determine different rest positions.. Hence the use of a sophisticated mechanical device like the Electromyograph was made to determine at what level exactly are the muscles of mastication in minimal activity. Moyers in 1949 was the first to apply electromyography to clinical dentistry.

Studies like those of Garnick and Ramfjord (1962)[5], Yemm and Berry, Moller(1976), Manns (1979)[6], Michellotti (1997)[7] have revealed that there is a variable difference between clinical rest position and minimal activity of masticatory muscles and that this minimal activity occurs over a range of about 8-11mm.

Keywords : Vertical dimension of occlusion, Mandibular rest position. Electromyography, Occlusal rehabilitation.

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The literature however does not indicate any study done on patients with a reduced vertical dimension. It is here that determination of the position of minimal activity is important. Such patients present with loss of tooth structure and innumerable problems. Since in these patients occlusal vertical dimension is lost it is important to have a guide to restore it . Hence a study was done to compare and evaluate clinical and electromyographic rest position in normal dentate patients and patients with a reduced vertical dimension .

MATERIALS AND METHODS

Selection of Sample

The subjects were divided into two groups-

Group A consisted of five males and five females 25-40 years old, with a full complement of teeth, without attrition, no history of orthodontic treatment, no TMJ pathology (excluded with a questionnaire) with a maximum opening of greater than 40 mm. And lateral movements greater than 7 mm.

Group B consisted of five males and five female patients 30-40 years old with signs of extreme wear of teeth and a reduced vertical dimension of occlusion. They had no history of TMJ pain or discomfort and had normal mandibular movements.

The subjects were educated previously to eliminate anxiety. For every subject the following was determined—

Vertical Dimension of Occlusion
Clinical Rest Position
Electromyographic Rest Position
Range of minimal activity.

The first two were determined by conventional methods after asking the patient to relax. Each subject was then subjected to the electromyographic study.

After placement of the electrodes (as described in the literature) clinical rest position was verified. The subject was asked to open the jaw slowly and to hold the jaw when the machine showed minimal activity. This was taken as the Electromyographic rest position and the distance between the two points, on the nose and chin was measured. The subject was further asked to open further till electrical activity started. This position was recorded and the range of minimal activity was determined.

The results were tabulated as follows—

DISCUSSION

Establishment and recording of the rest position has been witness to countless postulates and hypotheses. We have progressed from an era of constant rest position to an era where we now know that it is highly variable and subjective. Studies have proved that the temporalis is more important for maintaining postural mandibular position. However the masseter was used because

i) The masseter has lesser neuron : muscle fibre ratio (1 : 640) against 1 :936 for temporalis and hence a better precision of movements.
ii) Superficial location
iii) Ease of location , convenient to place electrodes

TABLE 1

Group 1 - Reading for the masseter muscle

Patient	V,D. occlusion	V.R.R. clinical	V.R.R. EMG	DIFF. EMG-Cli	DIFF. EMG-VDO	DIFF. CRP-VDO	RANGE
A	65.2	67.4	72.2	4.80	7.20	2.2	4.70
B	68.6	70.5	74.3	3.80	5.70	1.9	6.40
C	63.3	66.3	69.4	3.10	6.10	3.0	6.20
D	81.7	83.5	88.5	5.00	6.80	1.8	6.70
E	72.4	74.1	78.6	4.50	6.20	2.0	5.20
F	72.9	75.3	79.1	3.80	6.20	2.4	4.80
G	65.4	67.6	71.8	4.20	6.40	2.2	4.60
H	59.3	61.0	66.3	5.30	7.00	2.0	7.60
I	60.1	64.1	67.4	3.20	7.30	3.0	7.20
J	66.2	69.6	72.4	2.80	6.20	3.4	6.70
Mean				**4.06**	**6.51**	**2.39**	**6.01**

VDO = Vertical Dimension; VRR = Vertical Relation at Rest; EMG = Electro Myo Graphic; CRP = Clinical Position at Rest

TABLE 2

Group A - Reading for the temporalis muscle

Patient	V,D. occlusion	V.R.R. clinical	V.R.R. EMG	DIFF. EMG-Cli	DIFF. EMG-VDO	DIFF. CRP-VDO	RANGE
A	64.1	67.2	71.0	3.80	6.90	3.1	4.10
B	68.4	70.3	74.8	4.50	6.40	1.9	4.60
C	63.5	66.6	69.8	3.20	6.30	3.1	6.50
D	81.1	83.7	87.2	3.50	6.10	2.6	8.40
E	72.4	74.1	78.9	4.80	6.50	1.9	6.30
F	72.3	75.6	79.1	3.50	6.80	2.3	3.90
G	65.5	67.0	72.7	5.70	7.20	1.8	3.30
H	59.6	61.0	66.1	5.10	6.50	1.9	5.20
I	60.4	64.1	68.2	4.10	7.80	3.7	7.10
J	66.3	69.2	73.4	4.20	7.10	2.8	6.80
Mean				**4.24**	**6.76**	**2.51**	**5.62**

VDO = Vertical Dimension; VRR = Vertical Relation at Rest; EMG = Electro Myo Graphic; CRP = Clinical Position at Rest

TABLE 3

Group B - Reading for the masseter muscle

Patient	V,D. occlusion	V.R.R. clinical	V.R.R. EMG	DIFF. EMG-Cli	DIFF. EMG-VDO	DIFF. CRP-VDO	RANGE
A	70.6	76.3	81.4	5.10	10.8	5.7	7.6
B	60.0	67.8	73.6	5.80	13.6	7.8	5.8
C	64.2	70.6	75.2	4.60	11.0	6.4	6.9
D	67.4	73.5	77.7	4.40	10.3	5.9	5.4
E	62.2	67.0	71.6	4.60	9.40	4.8	7.9
Mean				**4.90**	**11.0**	**6.12**	**6.72**

VDO = Vertical Dimension; VRR = Vertical Relation at Rest; EMG = Electro Myo Graphic; CRP = Clinical Position at Rest

TABLE 4

Group B - Readings for the temporalis muscle

Patient	V,D. occlusion	V.R.R. clinical	V.R.R. EMG	DIFF. EMG-Cli	DIFF. EMG-VDO	DIFF. CRP-VDO	RANGE
A	70.6	76.3	80.3	4.00	9.70	5.7	7.8
B	60.1	66.8	71.5	4.70	11.4	6.7	6.5
C	64.6	70.3	73.7	3.40	9.10	5.7	6.6
D	67.4	72.2	77.0	4.80	9.60	4.8	6.7
E	62.1	67.3	72.6	5.30	10.5	5.2	6.8
Mean				**4.56**	**10.06**	**5.6**	**6.86**

VDO = Vertical Dimension; VRR = Vertical Relation at Rest; EMG = Electro Myo Graphic; CRP = Clinical Position at Rest

Skin surface electrodes were used because

i) They eliminate painful stimuli which may upset the delicate balance of factors involved in maintaining rest position
ii) Area 'seen' by them is large
iii) They are non invasive.

In this study the electromyographic rest position was always caudal to the Clinical rest position . This was because in the clinical rest position electrical activity is always demonstrated as the muscles are in a minimal tonic state of contraction, as per the definition of the rest position. The average difference between the two rest positions for the masseter and the anterior temporalis were 4.08 and 4.24mm for normal patients. Similarly the difference for the reduced vertical group was 4.90 and 4.56 mm respectively.

The vertical relation of rest is not a stable position but is taken up in response to circumstances-like the eruption of teeth; the size of the lips; length of the muscles; size and posture of the tongue ; and particularly the tendency of the soft tissues of the facial region to come to rest.

Hence the rest position is unreliable and inaccurate as a guide in determining the occlusal vertical dimension. A precise, accurate and a consistent value is what the clinician needs as a starting point from where an occlusion can be reconstructed . Electromyographic values cannot show inter-operator variability as they are given by a machine.

In this study the difference between the measurements for *electromyographic* rest position and the *vertical dimension of occlusion* in normal subjects was constant at 6.51 mm for the masseter and 6.76mm for the temporalis with a variation of 0.2mm.It is thus a reasonable conclusion that deduction of these constant values from the electromyographic rest position (which as discussed is a more reliable starting point) will enable the clinician to arrive at the future vertical dimension of occlusion in patients in whom the vertical is to be restored.

Although the use of a sophisticated device like the EMG may seem deterrent, it is well worth the time and expense for such patients as the vertical dimension of occlusion is so important. After all, the most common fault in occlusal rehabilitation is making the occlusal vertical dimension too high— so high that it is called the height of folly.

CONCLUSION

To conclude it must be stated that although much has been said and done about the rest position, this resting posture is something of a red herring, set to lead us away from the essential importance of the jaw separation when the teeth are together, known in current terminology as the occlusal vertical dimension. The rest position is a position in which the oral and associated structures come to rest and a space exists between the teeth in which a restoration can be fitted. It seems to be a reasonable starting position - not because it is the position of rest *(it is not)* - but because of it's functional characteristics. We must admit that rather than the rest position we should have a positive direct criterion for determining the *occlusal vertical dimension*- and such knowledge is hard to come by.

This study was done on two muscles only. More research needs to be done on a greater number of subjects , at various times of the day on greater number of muscles so that we can accurately identify as to how much vertical we restore and thus sort out the most pressing problems in cases of full mouth rehabilitation. In doing so can we convert the greatest obstacle into a stepping stone to success.

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Orthodontic and Prosthodontic Collaboration

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ABSTRACT

A case is presented of a patient with missing teeth, open bite and proclination of upper anterior teeth. The 25 year old patient was treated orthodontically. After closure of spaces, reduction of open bite and over jet, she was given a fixed partial denture in the lower anterior region. The profile has improved and the results are presented.

Hypodontia has been observed as one of the most common dental developmental anomalies. True anodontia or congenital absence of teeth can be classified into two types, total and partial. Total anodontia in which all the teeth are missing may involve both the deciduous and the permanent dentition and true partial anodontia involves absence of one or more teeth. In the permanent dentition the prevalence rate of true partial anodontia is 3.5% to 6.5% excluding agenesis of the third molars[1,2]. In the deciduous dentition hypodontia occurs in 0.1% to 0.9% of the population[3].

ETIOLOGIC CONSIDERATIONS

Though the etiology is unknown the most likely factors are hereditary, environmental factors and evolution[4,5]. The pattern of agenesis is explained by Butler's field theory that key tooth is most mesial in each class[6]. Most studies specify women as exhibiting more partial anodontia than men[7].

Egermark-Erikson specified 3:2 ratio of women to men in their studies, while noting greater incidence of hypodontia in women and hyperdontia in men[8]. Garn and Lewis. Baum and Cohen noted changes in tooth morphology and size in persons with hypodontia. They reported a diminution in size of associated teeth[9,10].

CASE REPORT

The patient was 25 year old female patient with the chief complaint of labially placed upper front teeth. She had a convex profile with incompetent lips (*Fig. 1*). Intraorally she had class I molar relationship. The maxillary and mandibular arches were symmetrical with spacing in the anterior region (*Fig. 2*). There was no history of permanent teeth extracted. She had an open bite of 5.0 mm and over jet of 7.0 mm. Both upper lateral incisors were missing. In the lower arch there was a conical tooth in the midline and all the anterior teeth were missing. The panoramic radiograph revealed the absence of upper lateral incisors, lower central, lateral incisors and canines. The lower central conical tooth had a well formed root. All the upper and lower posterior teeth including the third molars were present (*Fig. 3*).

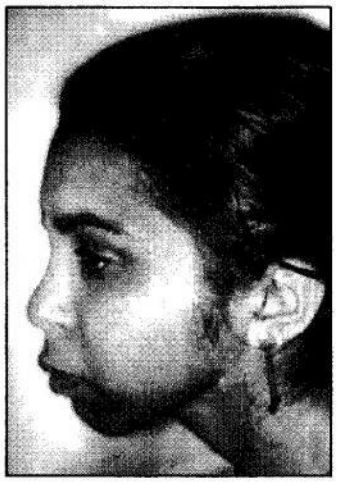

Fig. 1 : *Photograph showing patient's profile*

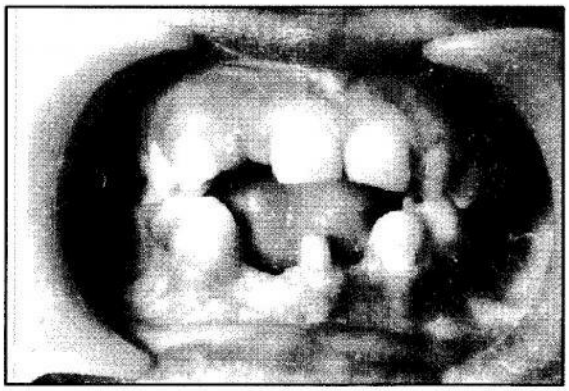

Fig. 2 : *Intraoral photograph showing openbite and missing teeth*

Keywords : *Open bite, missing teeth, fixed partial denture.*

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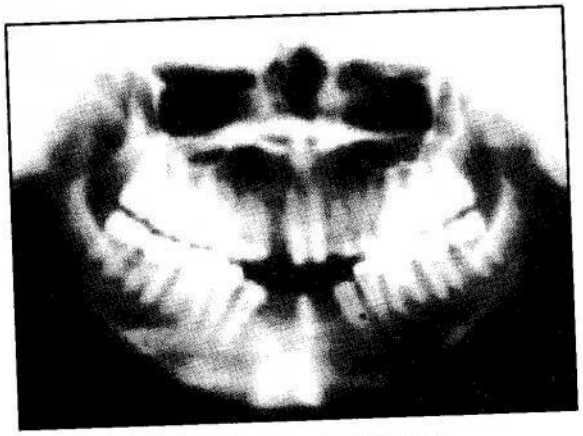

Fig. 3 : Panoramic radiograph

TREATMENT PROGRESS

It was decided to close the spaces in the upper arch bringing the canines into lateral incisor position and place fixed partial denture in the lower anterior region.

All the teeth were banded in the upper and lower arches. After initial alignment, maxillary space closure was performed and the upper anteriors were retracted. The lower molars were intruded with reverse curve of spee wires. Box elastics were given to close the anterior open bite. The lower anterior missing teeth were replaced by fixed partial dentures with the conical tooth in place.

Fig. 4 : Post treatment profile of the patient

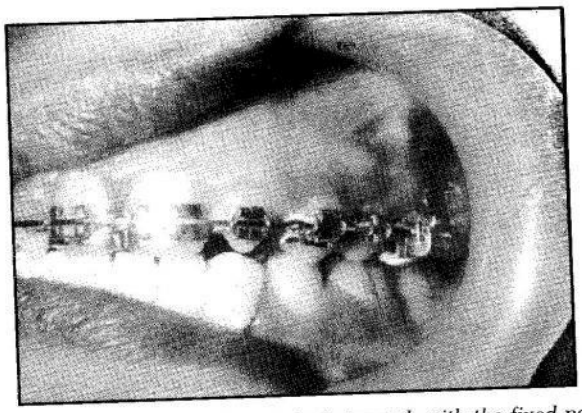

Fig. 5 : Post treatment Intraoral photograph with the fixed partial denture in place.

With the upper and lower anterior spaces closed, the profile improved drastically with overjet reduced to 2.0 mm. In the upper arch finishing wires are still in place (*Fig. 4 & 5*).

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Evaluation of the efficacy of denture cleansers

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INTRODUCTION

The maintenance phase of prosthodontic therapy is important for the health of the oral mucosa and longevity of the prosthesis. Transfer of the patient from active treatment status to a maintenance program is a definitive step in total patient care that requires motivation and effort on the part of the dentist. With the initial patient visit itself, a thorough education program should begin and should be interwoven through the phases of denture construction[4].

The process by which dentures accumulate plaque and calculus is apparently similar to that which takes place on the natural teeth[5,7]. Denture stomatitis, candidiasis and halitosis are all related to lack of denture hygiene[2]. The denture cleaning regimen should be designed to remove and prevent reaccumulation of microbial plaque, food debris, mucin, and exogenous discolouration.

Over the years, various materials and techniques for cleaning dentures have been used. These are classified as - mechanical (soaps / pastes / powders used with / without a denture brush, sonic cleansers) and chemical (commercial solution cleansers - alkaline peroxides, alkaline hypochlorites, disinfecting agents, enzymes)[1,4,6]. Peroxide cleansers are the most commonly used denture cleansers for almost four decades now. Electron microscopic studies have shown no adverse effect on acrylic resin after prolonged immersion[4].

A study was conducted to compare the efficacy of two commercial peroxide cleansers in controlling plaque accumulation. Simultaneously, the need of using chemico-mechanical methods for cleaning over mere chemical methods was evaluated.

MATERIALS AND METHOD

For the study, 10 complete denture patients in the age-group of 40-65 yrs. were selected. Subjects were randomly divided into two equal groups - A and B irrespective of age and sex.

The two cleansers used in the study were. Clinsodent (ICPA Pharma.) and Fitty dent (Group Pharma.). The active ingredient in both is sodium perborate monohydrate in an alkaline medium. The pH of the two cleansers in solution was found to be 11.6 and 9.6 respectively.

The study which was an open-label, comparative, parallel study was conducted over a 3-week period. Prior to the product testing phase, after delivering the dentures, all patients were instructed to clean their dentures by thoroughly rinsing in tap water only for 5 days. In the first follow-up visit, denture plaque scores were evaluated. This formed the 'baseline index'.

Evaluation of plaque accumulation was done using a disclosing solution of erythrosin as proposed by Wilkins (1976) and Augsburger and Elahi (1982). The denture was first rinsed in flow controlled warm running water to get rid of loose debris and saliva. Disclosing solution was uniformly applied over all the surfaces. After 30 seconds, excess dye was gently rinsed off. Each maxillary denture was divided into eight sections, four each on the facial and tissue surfaces[3] *(Fig. 1)*. The palatal polished surface was excluded since it gets cleaned by the cleansing movements of the tongue. Grading of denture plaque was done using Quigley. - Hein scale (1962) for "Prosthesis Hygiene Index" (PHI) :-

0 - No stainable plaque
1 - Light plaque - (1-25% area covered)
2 - Moderate plaque - (26-50% area covered)
3 - Heavy plaque - (51-75% area covered)
4 - Very heavy plaque - (76-100% area covered)

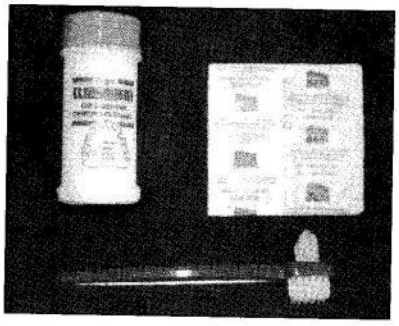

Fig. 1 : *Products used in the study*

In this visit, patients in group A were given "Clinsodent" denture cleansing powder and those in group B were given "Fitty dent" denture cleansing tablets for overnight soaking of dentures in cleanser solution. After 1 week, in the second follow-up visit, 'PHI' was recorded. Now patients were advised to use a denture brush after overnight soaking in cleanser solution. In the third and final visit, 'PHI' scores were once again recorded.

All the data was statistically analysed. Test of significance was applied to compare the efficacy of the cleansers statistically, $t_{.05}$ was calculated for 8 degrees of freedom.

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TABLE 1

Showing PHI in both groups, on tissue surfaces and polished surfaces

Group	Number of surfaces	1		2		3	
		Tissue Surface	Polished Surface	Tissue Surface	Polished Surface	Tissue Surface	Polished Surface
'A'	5	1.750	1.505	0.875	1.253	0.625	1.125
'B'	5	2.416	1.833	1.416	1.667	1.013	1.125

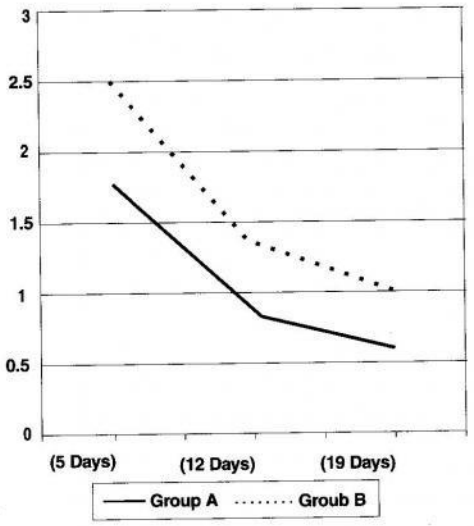
1 - PHI on surface on first visit, 2 - PHI on surface on second visit, 3 - PHI on surface on third visit

OBSERVATIONS AND RESULTS

Subjects in group A used 'Clinsodent' for the first week of product testing phase and denture brush along with it for the following week. Subjects in group B used 'Fitty dent'.

Table 1 : shows the average PHI for the maxillary dentures on the tissue surfaces and polished surfaces which was calculated and tabulated.

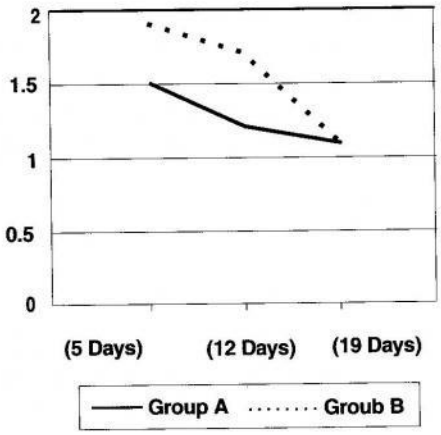
Graph 1 : shows a comparison of surface appearance of tissue surfaces on the three visits in Groups A and B.



Graph 1 : *Shows comparison of surface appearance of tissue surfaces on the 3 visits*

Graph 2 : shows a comparison of surface appearance of polished surfaces on the three visits in Groups A and B.

Table 2 : compares the ability of the two groups in controlling denture plaque by calculating the gradient of change in PHI from one visit to the next.



Graph 2 : *Shows comparison of surface appearance of polished surfaces on the 3 visits*

TABLE 2

Showing ability of the group in controlling denture plaque

Gradient	Group A	Group B
1	1.529	1.378
2	1.216	1.442

Gradient 1 : $\frac{\text{PHI after 5 days of prosthesis insertion}}{\text{PHI after 7 days of hygiene instructions}}$

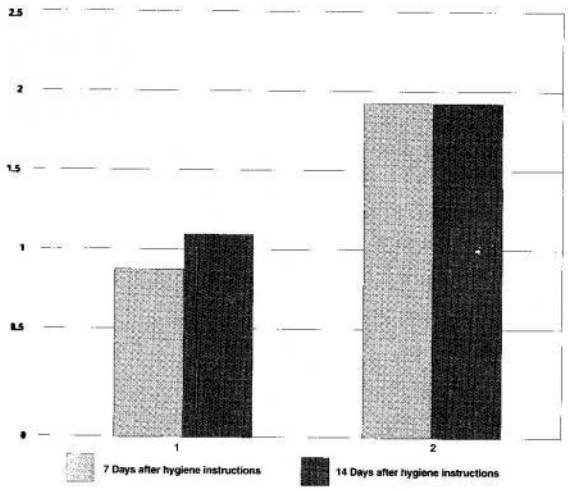
Gradient 2 : $\frac{\text{PHI after 7 days of hygiene instructions}}{\text{PHI after 14 days of hygiene instructions}}$

Graph 3 : is a graphical representation comparing the gradient in the ability of Groups A and B in controlling denture plaque.

Table 3 : test of significance applied to compare ability of Groups A and B in controlling denture plaque.

DISCUSSION

Removable dentures accumulate plaque similar to natural teeth in the oral cavity[5]. Plaque can be removed from the denture mechanically, chemically or an appropriate combination of the two methods. Peroxide cleans-



Graph 3 : *Ability of Groups 'A' and 'B' in controlling denture plaque*

TABLE 3

Test of significance comparing ability of groups 'A' & 'B' in controlling plaque

Time Period	Calculated 't'	Statistical 't'
7 days after hygiene instructions	1.02	2.03
14 days after hygiene instructions	1.25	2.03

t' calculated for 8 degrees of freedom at 5% level of significance

ers have been in use for a long time. They consist of peroxides or perborates in powder or tablet form which form an alkaline solution in water liberating nascent oxygen. This mechanically agitates accumulated deposits on the denture[2,4]. In this study, two peroxide solution cleansers were compared for their efficacy in cleansing dentures.

Baseline index of denture plaque was recorded 5 days after denture delivery until which patients only rinsed their dentures in water to clean them. After 1 week of using the product ('Clinsodent' by Group A and 'Fitty dent' by Group B). Average PHI scores showed a sharp decrease on the tissue surfaces and a steady decrease on the polished surface. Addition of a denture brush to the cleaning regime in the following week showed a steeper decrease in PHI scores on the polished surfaces than on the tissue surfaces. This can be attributed to the better cleansing of interdental areas mechanically[3,4,6].

A comparative analysis of the efficacy of the two products was not statistically significant, probably because of the same active ingredient and similar mechanism of action. However, the pH of the solution didn't seem to affect the efficacy significantly.

The following conclusions can be drawn from the study.

1. Both products were effective in controlling and reducing plaque formation and accumulation.
2. Overnight soaking of the denture in cleanser solution effectively removed newly formed plaque and light stains. Old stains, tenacious deposits and plaque in interdental areas or irregular surfaces needed mechanical cleaning as well.
3. Comparison of the efficacy of the two products was not statistically significant.

SUMMARY

This study emphasized the employment of chemico-mechanical methods for denture cleansing. Maintenance of denture hygiene is not only the responsibility of the patient but it is an obligation of the dentist as well to motivate and instruct the patient and provide the means and methods for plaque control.

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Infection Control For Dental Laboratory

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ABSTRACT

Infection control in the dental laboratory is no longer an option but a requirement. An enforced infection control policy in a laboratory will reduce occupational exposure to blood borne pathogens and other infectious diseases and protect the dental laboratory personnel from exposure to infectious disease. With a good understanding of the process, infection control can be performed as part of the daily routine with minimal time and effort. This presentation deals with various methods and precautions to be taken towards infection control in the dental laboratory.

INTRODUCTION

"Living on the edge" is often the term referred to dental & medical professionals as they are exposed to a wide variety of micro-organisms from the blood and saliva of patients. These microorganisms may cause infectious diseases such as tuberculosis, herpes, hepatitis - B and acquired immune deficiency syndrome. The use of effective infection control policy in dental office and dental laboratory will prevent cross contamination that may extend to dentists, dental office staff, dental technicians and patients. The patients have the right to expect the dental health care personnel to do everything possible to prevent the spread of transmissible diseases. Cross contamination & infections can be controlled only by measures that make the paradental personnels aware of their responsibilities. Careful training &, motivation should be given to them, in handling, fabricating & transporting, laboratory prosthesis & appliances. This is highly neglected dark zone of dentistry; which requires urgent attention as the member of dental health care team, should have the moral and legal responsibility to prevent the spread of diseases to co-workers; other health care professional, patients, and/or their significant others via the dental laboratory.[1,2,3,4]

The dental laboratory person is in an ideal position to ensure that all items brought from the dental office to the laboratory are decontaminated before they are distributed and subjected to treatment. Also, after laboratory work has been completed all items to be sent to the dental office and subsequently placed in patient's mouths should be disinfected before delivery.

A workable laboratory infection control policy should be precise, concise and written in a language that is easy to understand. It should include, stepwise, (A) Protection of dental laboratory personnel, (B) Disinfection of working area (C) Disinfection of all the prosthodontic materials used in dental office or laboratory.[1,2,4,6]

(A) PROTECTION OF DENTAL LABORATORY PERSONNEL

All laboratory personnel who have the potential for occupational exposure should have protective materials like, gloves (disposable, and/or puncture resistant utility gloves), facemasks, protective eye wear, laboratory coats, and disinfecting material like, handscrubs, cleaners and disinfectants. They should be vaccinated for Hepatitis B.

1. DISPOSABLE GLOVES :

This shall be worn by those who have the potential for direct skin contact with blood or other potentially infectious materials and when handling the items brought in the laboratory from dental clinic. Laboratory procedures that require use of disposable gloves include pouring impressions, packing items to be delivered to dental office, unpacking items received from dental office like bites, waxrims, trays, repair dentures, trial dentures and fixed partial denture, metal and bisque trials etc. Hands must be washed with an antimicrobial solution before wearing gloves and after removing gloves.

2. UTILITY GLOVES :

Puncture resistant utility gloves, such as neoprene or polynitrite gloves shall be worn by all laboratory personnel when cleaning and disinfecting equipment and surfaces. The utility gloves must be washed, cleaned and disinfected before they are stored away. Laboratory procedures that require the use of utility gloves include cleaning and disinfecting items and surfaces such as sinks, pumice pans, case pans, bench tops, ultrasonic cleaners, facebow transfers, articulators, mixing bowls, spatulas, bristle brushes, ray wheels, lathes, handpieces, vibrators, polymerization pots, model trimmers, containers for immersion disinfectants, grinding burs, stones, retrieving immersed prosthesis or appliance from disinfection solution and disposing of potentially contaminated waste.

3. FACE MASKS :

Face masks and protective eye wear should be worn while performing procedures from which they may expect splashes, spray, spatter, droplets or aerosols of contaminated liquid, causing potential harm to eye, ear, nose & mouth.

Laboratory procedures that require use of face masks and eye protectors include pouring impression, using vibrator, grinding with model trimmer, grinding with lathe

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