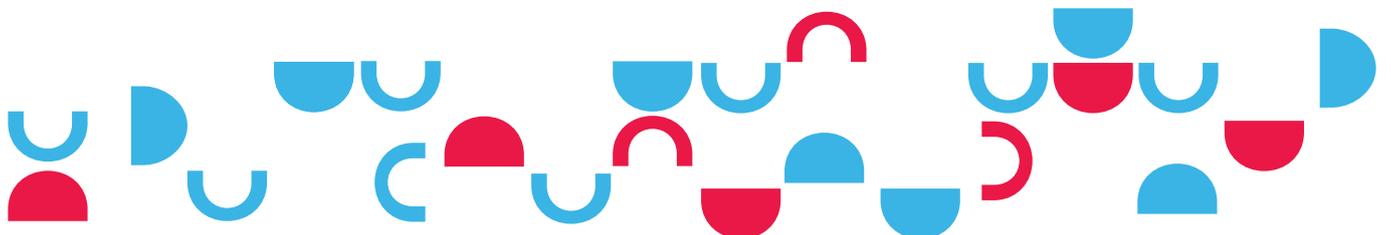


DR BOURKE'S ARTICLES

We have kept the written work of Dr Kevin Bourke unedited, as he published it.



The effects of the MYO Appliance in children with malocclusions of the primary dentition

By Dr Kevin Bourke

The myofunctional device variously called: "Munchee," "Chewer" MYO or O.P. device has been extensively researched for the past 30 years both in Australia and Japan.

In Australia, clinical research has shown the "MYO" to be an excellent therapeutic modality in the treatment of open bites and anterior protrusions of the mandible. In Japan research was done at Osaka Dental University, under the chairmanship of the Dean Professor Toyoda Heida, involving faculty members Dr. Masihiko Mine, and Masihiko Yoshihara. Their results, involving plaque control, cranio-facial muscle competence, changes in gnathic relationships, salivary gland secretions, were all positive, suggesting that myofunctional therapy with the "MYO" should be routine therapy for all children, particularly those between the ages of 3 and 6 years, when the stomatognathic system is at its most important state of development. Many members of the Australian Academy of Orthopaedic Orthognathics have found the "MYO" to be a superb adjunct in the field of functional appliance therapy, where it not only gives authority to the cranio-facial musculature, but by therapeutic massage of the oral tissues, it maintains them in states of health through extensive treatment periods.

This exciting information has been researched at Osaka University for some time, with detailed findings to be published by Dr. Yoshihara in 1991. Speech therapists are now very interested in the myofunctional device, noting that many speech defects in young children are directly related to faulty occlusion. In cases of severe skeletal or dental malocclusion, the infant should be encouraged to exercise the stomatognathic system for about 30 minutes daily. In such cases improvement may be expected in the occlusion and appearance of the infant in periods sometimes as short as 3 months. As with functional appliance therapy, compliance can be a real problem, and so the dentist needs the help of a "Motivating Kit" which consists of a small album, showing the excellent before and after results, which have been obtained in other infants, after constant daily use.

Where no gross orthodontic problem exists, regular daily use of the myofunctional device (MYO) for about 4 minutes, helps improve the alignment of the anterior teeth and gives authority to all musculature of the stomatognathic system. The appliance if used as directed has excellent preventive potential.

Practitioners involved in treating open bites, and tongue posture problems, have in the past, made use of myofunctional therapists and custom made appliances to discourage abnormal tongue habits. These appliances were constructed with spikes or guards to discourage aberrant tongue posture. Many practitioners found the above methods inconvenient for the parent or the child with unpredictable results. The use of the MYO suits well the philosophy of the functional orthodontist.

When the MYO appliance is placed in the mouth for a sustained period, such as when an infant is watching television, then that infant is trained to breathe through the nose. Most functional orthodontists emphasize the importance of nasal breathing for proper facial development.

Dr. R.M. Ricketts found that if the nasal cavity is not developing properly then the palate will frequently be elevated in front. The diet in the modern world is insufficient in fibre content to activate sufficiently the facial and pericranial musculature. There is much truth in the saying that "stasis is the basis of disease." The MYO provides the necessary exercise to oxygenate and empower the muscles of the stomatognathic system. Just

as modern man needs a combination of aerobic and strengthening exercises to keep his body fit so also does one need a non-traumatic exercise for the pericranial, facial and neck musculature.

When MYO therapy is used the blood supply to the musculature has been shown to increase between 6 and 20 minutes. Dr. R.M. Ricketts has stated that the need for early treatment, mentioning that he frequently commenced treatment on 4 and 5 year old children. Now with the availability of the "MYO," treatment may be commenced as early as 3 years. The young bone is very susceptible to environmental influences both good and bad, and many habits such as thumb sucking and mouth breathing can be countered and often completely nullified with MYO therapy.

Osaka Dental University has research work to show that the competence of the orbicularis oris can be doubled in most 3 to 6 year old children in a 3 month period.

TABLE 1 - Development of myodynamic lip force observed in the children who had used OP device for 20 minutes a day continuously for 9 months (Normal occlusion)

Sample	Age	Before Op	3m later	6m later	9m later
1	3	350	450	600	700
2	3	400	525	700	750
3	3	300	425	550	600
4	3	350	300	425	600
5	3	325	400	650	700
4	3	375	400	450	500
7	3	450	450	500	550
8	3	525	550	700	700
9	4	600	750	850	900
10	4	400	400	550	750
11	4	650	700	850	900
12	4	350	425	470	495
13	4	375	400	475	600
14	4	375	400	600	650
15	5	550	650	650	800
16	5	600	800	1000	1000
17	5	400	500	700	1000
18	5	500	650	725	800
19	5	550	660	800	800
20	5	300	350	500	600
21	5	550	650	700	900
22	5	650	700	850	850
23	5	700	750	900	925
24	5	500	600	60	650
25	6	500	575	625	700
26	6	450	650	650	700
27	6	575	650	1000	1000
28	6	375	450	800	850
29	6	475	550	750	900
30	6	700	650	900	1000

(unit:gram)

Table 2 - Development of myodynamic lip force observed in the children who had used OP device for 20 minutes a day continuously for 9 months (Abnormal Occlusion).

Sample	Age	Before Op	3m later	6m later	9m later
1	3	200	225	225	350
2	3	250	300	350	375
3	3	200	200	350	400
4	3	100	150	250	300
5	3	400	450	500	500
6	3	250	400	700	750
7	3	100	325	400	500
8	3	150	400	650	675
9	4	175	200	525	650
10	4	250	300	400	525
11	4	300	350	500	700
12	4	200	150	300	350
13	4	500	550	700	700
14	4	150	250	700	725
15	4	250	400	700	750
16	4	150	350	1000	1000
17	4	450	500	700	850
18	5	250	400	700	750
19	5	175	200	525	550
20	5	300	350	500	500
21	5	150	250	700	725
22	5	200	450	800	950
23	5	250	450	60	750
24	5	250	450	800	800
25	5	300	450	600	950
26	5	350	500	800	825
27	5	400	500	800	800
28	5	375	400	550	550
29	5	325	400	600	625
30	5	500	700	750	750
31	6	400	550	700	950
32	6	400	600	600	700
33	6	500	500	550	700
34	6	500	750	750	900
35	6	425	500	650	700
36	6	475	500	600	600
37	6	375	400	550	900
38	6	350	400	600	600
39	6	325	450	600	625
40	6	300	350	400	400

(unit:gram)

Note that the figures for children suffering abnormal occlusion are, after nine months' use of the MYO, generally better than those for children with normal occlusion.

They have scientifically shown that which we have always intuitively known that young children with developing malocclusions, always have impaired competence of the orbicularis oris. (See tables one and two)

Chewing on the device produces a copious salivary flow up to 30 times the resting flow rate, and certainly many times greater than any chewing gum which is currently being advertised as important in the remineralisation of interproximal enamel during the 20 minutes following food intake.

The MYO was originally called the "Chewing Brush" and the O.P. (Oral Prophylactic) device because of its capacity to physically remove plaque. As used by a child as a cleaning device only, it was shown to be about 20% more effective than a toothbrush, being exceptionally efficient on the lingual surface of the teeth.

As a therapeutic modality in the field of the physical therapist the myofunctional device may have an important part to play, both as a diagnostic device, and as an aid to treatment, when the occlusion is causing pathology in the cervical spine.

There are many instances in daily dental practice where a patient may gain help from the myofunctional device.

Case Reports

Case number 1: A.G. is a female aged 3 years and 4 months with a severe open bite and speech impairment related to the dental problem. (Fig 1) The child and mother were motivated for about 15 minutes on how to use the MYO. A.G. began chewing on the appliance twice daily for 2 minutes. This time was gradually increased to 4 minutes in a month. The open bite closed at the rate of 1 mm a month. (Fig 2)

Currently, it is recommended in cases of this type that the child exercise with the appliance for 10 minutes daily after the first month and to leave it in the mouth for another 30 minutes. This results in faster improvement.

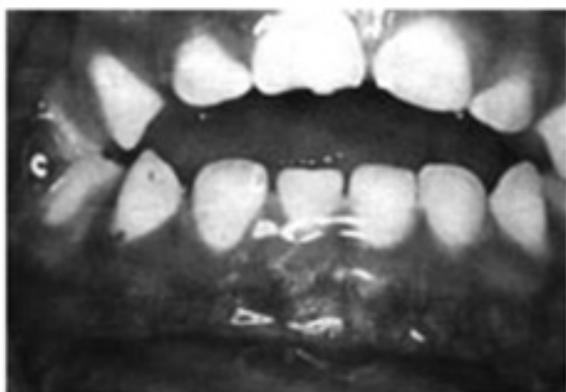


Fig. 1 A.G. is 3 years, 4 months old with a severe open bite and speech impairment.

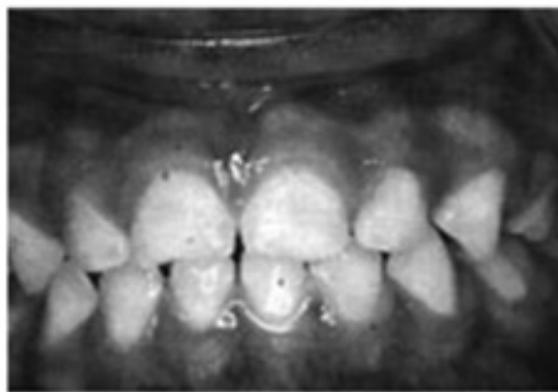


Fig. 2 A.G. is shown posttreatment with an excellent occlusal relationship.

Case number 2: J.F. is a 2 1/2 year old female with severe Class III malocclusion (Fig 3) that was observed at age 2 years. Treatment was postponed until now and consisted of a Sim-type upper sagittal appliance with bands on the second primary molars. This appliance was activated for 3 months. The cross bite was corrected at this time, but it took another 3 months for the posterior to contact. (Fig 4)



Fig. 3 J.F. is 2.5 - years-old with a severe Class III Malocclusion

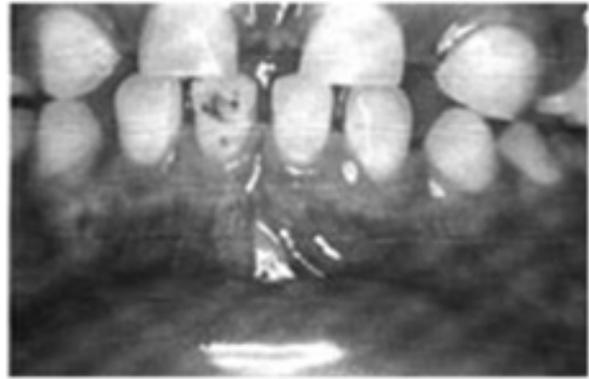


Fig. 4 J.F. is 3 - years - old with a Class I occlusion

All the time J.F. was chewing the MYO twice daily for 4 minutes.

Case number 3: A.E. is a 4 year 11 months old boy (Fig 5) who used the MYO appliance for a total of 18 months. The action of the MYO is thought to improve functionally of the musculature and esthetically the teeth and face. Perhaps all infants need aerobics for the face to keep the stomatognathic system developing to its full genetic potential.



Fig. 5 A.E. begins to use the appliance.

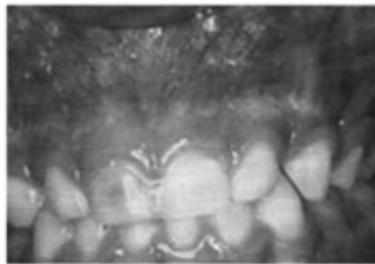


Fig. 6 A.E. is half way through the treatment

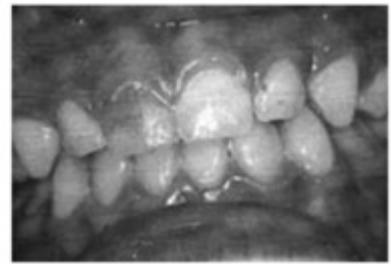


Fig. 7 A.E. is completed after 18 months of using the MYO.

Case number 4: S.B. shows a 48 hour plaque accumulation that has been stained. (Fig 8) After 3 minutes of chewing with the MYO most of the stained plaque has been removed (Fig 9). After 6 months of using the MYO, the open bite has been reduced and a normal occlusion is the result.



Fig. 8 S.B. shows stained 48 hour plaque accumulation



Fig. 9 S.B. uses the MYO for 3 minutes to clean her teeth.

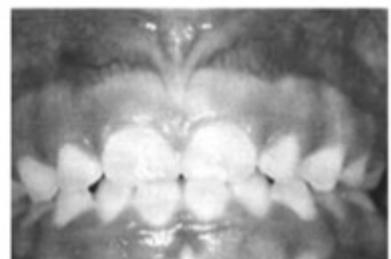


Fig. 10 S.B.: after 6 months of using the MYO excellent occlusion is achieved

Presented at the 9th Asian Pacific Dental Conference

The Chewing Brush - Oral Physiotherapy

By Dr Kevin Bourke

Prevention of Caries and Periodontal Disease is the chief value of the chewing brush. In the following pages I wish to examine some of the more recent insights into oral pathology and to correlate them with oral physiotherapy by chewing brush usage.

Once oral disease is established, I believe that use of the chewing brush, will greatly retard progress of both Caries and Periodontitis by raising the host resistance of the patient. In the case of Periodontal Disease, by improving the metabolic status of the alveolus and surrounding musculature as well as containing the microbial environment. In regard to Caries, by physical cleansing of the mouth and better flow of parotid saliva which is by far the most hypotonic of all body exudates.

Prevention of oral disease can be stated as the ability of the host to resist the undermining of his status by microbial and traumatic factors.

Periodontosis, which occurs mainly in children and young adults appears to have a different etiology to Periodontitis. Some bone loss takes place within the framework of a less virulent microbial attack. It has recently (1978 Phoenix) been suggested by R. Parr (University California) that in cases of Periodontitis perhaps two or even three distinct diseases may be present. So it can be seen that the simplistic illusion that bacteria was the initial and all prevailing cause of Periodontitis has finally lost its lustre and more realistic approaches involving Parafunctional Forces (Walter Drum) Faulty Bone Metabolism (Mathews 1978), Genetic Factors (Steward 1978), Orthodontic Considerations (Vanarsdall 1978), Sex Hormone Variance (Allen) and many other considerations involving occlusion, stress and Prostaglandins have assumed their rightful role in being very meaningful factors in a multifactorial disease.

It has been demonstrated that the MYO Munchee markedly tips the balance in the host's favour because of the following:

1. By improving the quality and quantity of alveolar bone
2. By improving the quality and quantity of the attached gingivae
3. By generating more competent oral musculature (proven University Osaka 1978), particularly the orbicularis oris, the muscles that facilitate nose breathing
4. Protective properties of saliva
5. Minimizing microbial attack by physical cleansing
6. Aiding diffusion of Nutrients to oral epithelium

Alveolar Bone

It is a factual statement that the humerus is 20% larger in the hitting arm of a good tennis player than the non-hitting arm. Bone is a much more Dynamic tissue, as shown by recent studies than we ever conceived in past years. Numerous laboratories all over the United States and elsewhere, have belatedly realised its importance in Periodontal Pathosis and a wealth of literature is now appearing, clarifying the methodology of calcium deposition under specific laboratory conditions. For instance, it has been shown, that within seconds after Vit D has been administered in large doses into the blood stream, the osteocytes at the bone interface, become activated by a bone activating factor switched on by the Vit D.

Mathews has shown, that when substances such as P.T.H. (Parathyroid Hormone) or Vit. D are administered, the bone always follows a pattern of A.R.F. - activation, resorbtion then formation. Mathews says that so many new things are being discovered about bone that it is difficult to keep up with them.

Bone serves as a store for several different minerals. It serves as a support and attachment for muscles. - It houses the Lymphocytes and Neutrophils, so important in the hosts cellular and humoral response mechanisms. It responds to pressure and stress like any other tissue - it can enlarge if the need arises, and it is always in a state of remodelling.

In people over 30 years of age - A.R.F. is taking place, but the formation or remodelling is not generally keeping pace with the resorbtion - this discrepancy is accentuated Klinikhamer believes, as a result of lack of oxygenation of the tissues. James Klinkhamer is the professor of Clinical Medicine at the University of Texas. For 20 years he has investigated the Orogranular Leucocyte and has recently shown it to be an accurate gauge of oral pathology, he stressed that two factors were of ultimate importance in the maintenance of a healthy Periodontium.

1. Oxygenation of the body tissues - cardiovascular exercise
2. Oxygenation of the Alveolus - by Function

Obviously, the chewing brush must be of great importance for Klinkhamers second prerequisite. It seems reasonable to suggest, that if the alveolar process is stimulated by oral physiotherapy, particularly during those periods when it is undergoing maximum development (4-6 years - and 11-16 years) than one would expect, that the developing alveolar process would closely approximate its maximum growth potential as determined by the genetic material on the D.N.A molecule.

I discussed the idea of stimulation of mandibular and maxillary bone by means of the chewing brush with Professor Barker - Professor of Anatomy at Sydney University - He completely agreed, that such functional stimulation would have a powerful effect on the development of the facial bones and would be beneficial to all age groups - Professor B. Barker has examined the skulls of numerous aborigines and is an authority in this field - He contributed an all important article to the American Academy of Periodontology Journal, pertaining to bone apposition to the alveolar crest in aborigines, which clearly demonstrated that under ideal functional conditions, the gingival attachment can remain at the cemento-enamel junction during life.

Not only do I believe that more bone would be laid down as a result of oral physiotherapy, but I believe that the quality of the bone would be improved. What is good quality bone? It is that bone, which is laid down primarily or at a remodelling stage in an ideal environment. Let us look at some factors which contribute to such an environment.

1. Thyroid and Parathyroid hormone normalcy
2. Vit. C. sufficiency
3. Calcium Phosphate balance
4. Nutritional Factors - influencing such factors as Lipoid Glyco Protein which is always present whenever bone is being laid down, and good oxygenation
5. Bone stimulated by function - Mathews claims that when bone is bent by stress, an electrical discharge of up to 80 millivolts takes place - this discharge seems to be a necessary part of healthy bone metabolism
6. Psychological factors - E.G. Klinkhamer has shown that the migratory rate of the Oroganular Leucocyte in the mobile Mucous Phase is affected by the auto nervous system
7. Occlusal Balance - Walter Drum (Berlin University) has demonstrated the adverse effect of Parafunctional Forces on the Periodontium
8. and necessarily, a large number of yet undiscovered factors, inter-connected with this very complex mechanism.

Whenever a platelet hits a vessel wall (and this is happening all over the body) Prostaglandin like compounds are formed. The first step is an Endoperoxidase formation. This is the result of action by the Prostaglandin Enzyme Cyclooxygenase (this latter Enzyme is inhibited by Endomethazone) and compounds like P.G.E.1 and P.G.E.2 are formed, also some very complex substances which have a half life of 5 seconds, substances are very much involved in platelet aggregation and very rapid responses from the blood vessels - we know also, the P.G.E.2 has an effect on calcium absorption rates in bone and latest (1978) findings that the Osteocyte and Lymphocyte of the Alveolus are blood borne derivatives - probably coming from the spleen and that they appear at the bone surface interface only seconds after the administration of P.T.H. All of this exemplifying the dynamic nature of Alveolar Bone.

The relationship of Prostaglandins to inflamed tissue, fits neatly into the theory of bone pathology being the primary mediator in Periodontitis and Periodontosis. Whenever, Alveolar Pathology exists, whether it be in the bone or gingivae, Prostaglandins are present. They are present in badly inflamed gingivae in amounts six times greater than mildly inflamed gingivae, to the extent of 100MG/GM. They have been shown to be present in quantity of 400MG/GM in purulent exudate from Periapical Abscesses. We know now, why Eugenol is such an excellent treatment for inflamed pulp - it is an excellent Prostaglandin inhibitor. Also, it now seems certain, that Prostaglandins play a key role in Rheumatoid Arthritis - the Arthritic condition is not one of inflammation, yet Prostaglandins are present - this I believe is a very important point in Alveolar Pathology Etiology. It suggests for instance, that Walter Drums theory of bone resorption under parafunctional stress can take place with the support of Prostaglandins without pain or inflammation. Intuitively I feel, that the Prostaglandins affect the hosts autoimmune response in the sub-sulcular epithelium layers. The presence of Prostaglandins in small numbers in the alveolar process, would not be detected by X-rays. It is only when they are present in large numbers, that areas of radiolucency are seen.

As a clinician of 30 years experience, I have noticed that Trabecular spaces are more definitive in the healthy alveolus, that bone trabeculae are of better quality, i.e. thin and crisp - the blood colour less venous static in appearance and the bone is architecturally more predictable. Having penetrated alveolar bone with a Beutalrock Drill on more than 150,000 occasions to produce intraosseous anaesthesia, I am confident about this observation.

A Japanese study within the last four years showed that 90% of nocturnal tooth grinding was inaudible - now we know, that Bruxism is much more widespread than was previously thought. This study has really significant ramifications because it harmonises with Walter Drums thoughts about Parafunctional Forces and Periodontal Pathosis - it also explains the catholicity of Periodontitis. Any clinician of several years standing who has been seeing and perceiving, is very much aware of occlusal Trauma. The tensions in our environment, not only

are one of the basic factors related to cardiovascular disease but they have detrimental effects on alveolar processes not kept "fit" by oral physiotherapy. It seems that the poorly formed alveolar bone in 20th Century man is no match for Parafunctional Forces. The widespread problem of temporomandibular disturbance, increased alcoholic intake, increased use of drugs, sleeping tablets etc. is testimony to man's internal pain. It has recently been stated by Haddad (Phoenix 78) that the T.M.J. Syndrome and associated pain from muscle spasm, is the result of psychological problems, and that relief comes temporarily by altering the occlusion e.g. with a bite plate - because it shatters the psycho-musculatory spasm reflex which had been established.

It has been demonstrated by Ayer and Levin (A.U.D. 1975) that Parafunctional Grinding habits can be successfully treated by massed practised exercises of daytime tooth clenching - i.e. clenching hard for five seconds and repeating this procedure six times in a session and repeating each session six times daily. The findings of Rugh and Solberg have provided additional support for the efficacy of this therapeutic modality. It seems reasonable to suggest that clenching with a chewing brush in place would be a more comfortable experience than clenching without this appliance (causing better lymph drainage).

All our endeavours until now in the prevention of Periodontal Disease have been associated with plaque removal and I believe such hygiene is commendable for 20th century man because of his close relationship with his fellow humans - no person would understand this point better than a clinician who is in ultra close contact daily with his patients. However, we Australian Dentists have turned a blind eye to the generally disease free alveoli of our own Australian natives. Who, having lived off the bush have chewed their way to Periodontal health. All who have had occasion to examine a tribal aborigine's masticatory apparatus must have been impressed by the bone quantity, the lack of bone loss and the extent of occlusal wear on the molars - all this painting a picture of "Dental Health Through Function".

In the aborigine we observe host resistance at its best without the necessity for plaque control. A moment's reflection is sufficient to recall the soft food that passes through our oral cavities to the Oesophagus - scarcely a good chew for more than a few seconds daily. Would our muscles function properly with lack of usage? Then why should our alveolar processes! What study in recent years has been completed to negate this theory? - I have read every article in the A.J.P. and attended their annual meetings over the last 3 years in America and am amazed, that so much talk can take place about Periodontal Disease without a word being spoken about the benefit of function on the cells of the area. Wolff's Law is a well known principle stating in general, that the morphology of a bone becomes progressively adapted to the sum of all the changing mechanical forces exerted upon it during growth and development. When these forces obtain functional equilibrium with the physical properties of the bone, growth ceases, and the morphology of the bone is then in balance with the mechanical needs of its various functions - Once more a reason to stimulate bone growth with the chewing brush particularly during the periods of maximum development.

A further study by Squire and Costley (A.P.J. Feb. 76) on dieting patients is of much interest. They found that as the fasting period lengthened, there was a decrease in plaque index scores, but the gingival index scores increased considerably - this study contradicts the theory that plaque is the basic causative agent, but supports the theory of insufficient alveolar bone stimulation as being the central issue.

Finally Packman, Shorer and Stein (A.J.P. 1977) have demonstrated by fiberoptic techniques that

1. Autoregulation of blood vessels,
2. Transmural pressure in a tissue,
3. Oxygen tension,
4. Bone Metabolism,
5. Areas of Tension in Periodontal Tissues,
6. Areas of stress in Periodontal Tissues are all interrelated and emphasise the importance of chewing (especially with forces in excess of 180 GMS) to bone development, health and remodelling

The Attached Gingivae

Maynard and Ochsenbein reported that 10 of 100 children examined had muco gingival problems on the facial aspects of the mandibular incisor region - It has been my experience that over 50% of children between the ages of 9 - 12 have gingival conditions showing signs of pathology which does eventuate by the time the patient reaches 18 years.

This thickened margin and in particular the Bulbous Col result from weakened host resistance followed by bacterial antigen invasion of the sulcular epithelium.

The weakened host resistance is due to -

A. Insufficient usage of the Masticatory apparatus (Question such a child and it will be found that he has a soft diet for nearly every meal sandwiches (no crust) etc. Hardly a decent chew the whole day through.

B. Muscular incompetence causing -

1. Mouth Breathing
2. Insufficient flow of saliva and stagnation of the mobile mucous phase of the oral secretions, which comes from the mucous and Sero Mucous Glands.
3. Eating excess carbohydrate and sticky food which find a well prepared "Perch" over the whole of the oral mucosa because of mucous stagnation. High Dietary sugar causes dysglycemis which contributes to oral pathosis.

The Respiratory System moves its secretions by ciliary activity. The digestive system moves its secretions by muscular activity and the problem with children is that they are generally lazy in an ORO-musculature sense.

Now the chewing brush stirs up the settled mucous secretions, which covers all surfaces both epithelial and mucous and washes this material out of the mouth with parotid saliva - anyone who has used a chewing brush will attest to the voluminous amount of saliva which is secreted. Now, in any mouth the number of Leucocytes secreted through the sulcular epithelium into the mobile mucous phase of the oral secretions is constant, and is dependent upon the alveolar pathology in that particular mouth. - The figure is around 1/2 million Leucocytes secreted every thirty seconds in a healthy mouth. It has been suggested by Klinkhamer that the Orogranular Leucocyte count could be used by the clinician as a Barometer for oral disease occurring in any particular mouth.

The Oroganular Leucocyte, Phagocytoses Bacteria in the oral cavity and in particular in the gingival crevice. The crevicular area, having been recognised as vital to the maintenance of gingival health, is kept viable in its bacterial environment by gentle massage. The prongs are not meant to clean between the teeth - their purpose is to rub the epithelium on the oral surface of the col causing.

A. Keratinization of the Col Epithelium

B. Expressing from the cervix any stagnant exudate - such as Rods and Spirochetes which may or may not be coated with immunoglobulins 1gA 1gM 1gE 1gG or complement and leaving the sulcular epithelium less susceptible to proteolysis from crevicular lysosomal enzymes like collagenase.

It should be noted that toothbrush bristles do not clean beneath the crevicular epithelium, but merely express exudate from the crevice, similar to the chewing brush, but frequently with greater trauma to the gingival margins. The gentle rubbing of a rubber prong with copious saliva as lubricant is more conducive to gingival health than the traumatic action of a hard bristled brush.

In young children 3-7 years the only oral hygiene required is daily chewing for 4 minutes with the chewing brush resulting in 400-500 chews.

The attached gingivae benefits:-

1. By cleaning the epithelial surface of epithelial and cellular debris thus lowering the nutritional element for oral microbia.
2. Stimulation of the underlying collagen and connective tissue producing 1. Better Tissue Fluid Circulation. 2. Less Obstruction for the host cellular defence mechanism passing into crevicular area
3. Producing knife edge margins and rapid nutrient diffusion
4. Keratinization of the attached epithelium

Pocket depth is not now considered to be a true Barometer of the disease state. The attachment may be of an epithelial or connective tissue nature and may on occasions exceed 6mm in depth and remain healthy. - In such a case, the hosts resistance as expressed in the crevice, overcomes the attack by the antigen and so molecular toxins do not penetrate the junctional epithelium and the underlying basement membrane setting the alarm for the hosts autoimmune response and plasma cell infiltrate coming from the Tlymphocyte. When the coronal part of the attached gingivae becomes thick, it is possible to have histopathology taking place beneath the sulcular epithelium with connective tissue infiltrate into the junctional epithelium and plasma cell infiltration into the connective tissue, without the pathosis being observed macroscopically. The advantage of daily oral physiotherapy, is keeping the gingival margin thin and keratinized.

The chewing brush must be seen as a preventive appliance giving better metabolic status to the tissues of the masticatory mechanism - it will not heal attachment breakdown in deep pockets, but will certainly impede the progress of the disease, except in those instances where gross pathology is present, vigerous chewing may do more harm than good.

Until now, all Periodontal health modalities have worked by tipping the balance in favour of the host, by lessening the bacterial attack. - The chewing brush, using oral physiotherapy, not only reduces the attack but also improves local Host resistance.

COMPETENT ORAL MUSCULATURE

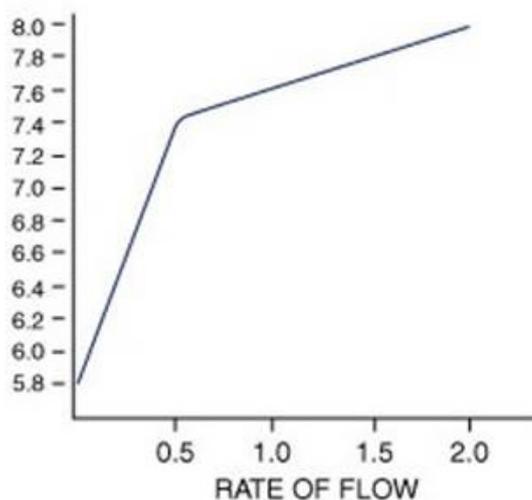
Drs. Heida, Yoshihara and Mine have recently demonstrated at the Osaka University dental school that young children (4-8 years) after four weeks use of the chewing brush, increased their Oro Musculature competence from around 150gms to 600gms. The method used, was to place a small rubber ball between the teeth of a child, with string attached, then to apply force to the string in an effort to dislodge the ball.

Utilising the results of this experiment the chewing brush was used on those children with developing orthodontic problems, due to facial musculature incompetence with excellent results. So far, this field of preventive orthodontics is still in its early stage and much more study is required to discover its potential.

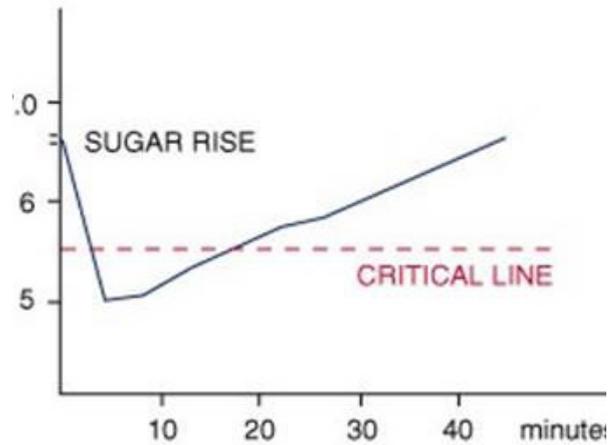
PROTECTIVE PROPERTIES OF SALIVA

Because saliva is affected both quantitatively and qualitatively by the chewing brush, it is important to look closely at its properties to ascertain its potential to maintain oral health.

We know that if a sugar solution is rinsed around a mouth containing an average amount of plaque, that the pH inside the plaque may fall to about pH5-5 and surface of the enamel tends to dissolve. However, saliva has the ability to wash the sugars from plaque and restore a higher pH above the critical line pH5-5. (Jenkins Indent 1973).



Not only does the chewing brush produce copious amounts of saliva to nullify any acid production in plaque but it also produces a very alkaline saliva because of the rate of flow. That rate is 30 times the normal rate for parotid saliva. The increase in pH is demonstrated in the following graph.



[Work done by G. Neil Jenkins Professor Oral Physiology University of Newcastle, United Kingdom].

This ability of the chewing brush to raise the pH of saliva from PH 5.8 to pH 7.4 in 30 seconds must have a resounding effect on acid production in plaque and on the oral microbia in general. Not all microbia cause pathosis - indeed some micro-organisms particularly gram positive occi, lessen the virulence of pathogenic organisms and act as a positive force for the oral health of the host.

Below is a list of endogenous factors - which influence oral microbial ecology and therefore oral health. Factors indicated by a are influenced by the chewing brush.

Humidity	✗
Surface Morphology of Tongue	✓
Temperature	✓
P.H.	✓
Oxidation Reduction Potential	✓
Saliva	✓
Crevicular Fluid	✓
Immune Mechanism	✓
B Teeth	✗
C Gingival Sulcus	✓

Alfano speaking on Periodontal Pathology made two conclusions relevant to chewing brush usage.

1. That effective host resistance is dependent upon the composition and flow rate of the saliva.
2. That the permeability of epithelial surfaces is governed by -
 - a. The pH of the penetrating molecule
 - b. The presence of bacterial enzymes their temperature and concentration

It is of much interest to note that the PH of saliva, bacterial concentration in saliva, rate of flow and temperature of saliva, are all affected by the chewing brush. After several weeks use of oral physiotherapy, salivary flow is produced more rapidly and in greater abundance. This is probably due to a physiological hyperplasia of the acini cells of the parotid and increased activity of its secretory granules.

In 20th Century man, oral odours constitute a significant segment of his personality. So much of our uniqueness is expressed via our speech, our smile, our facial expressions, as is our breath of much importance in interpersonal relationships. Joseph Tonzetich PH.D Professor Oral Biology at University of British Columbia has this to write (Jan. 77 A.P.D.).

The most objectionable odour in all individuals, regardless of the health status of the oral tissues is evidenced after prolonged periods of decreased salivary flow as exemplified by early morning air samples. During sleep, the salivary flow is essentially zero, and there is more than adequate time for uninterrupted putrefaction to occur.]

So the chewing brush, by keeping the salivary mechanisms in good condition, plays a beneficial role in countering oral malodor. Those who use a chewing brush agree about the oral cleanliness experienced.

SALIVA AND THE IMMUNOGLOBULINS

The presence of immunoglobulins in external body fluids is well established - 1gA is the major antibody component in saliva while 1gA is one of the dominating immunoglobulins in the gingival legion. 1gA occurs in parotid saliva in concentrations of 6.5MG% and where gingival pathosis is present, in concentrations of 189.9MG% in crevicular fluid. The immunoglobulins and complement are both part of the hosts response to antigen.

R.J. Nisengard D.D.S. Ph.D (A.J.P. 1977) says that gingivitis and periodontitis is almost universal therefore most of us are daily utilizing our 1gA in saliva to cope with bacterial products in our mouths. It is therefore reasonable to assume that our salivary processes should be exercised thus nullifying bacterial activity and preventing an over load on the hosts defense mechanisms in the gingival crevice.

We now know that it is the CA salts present in saliva which are the key to increasing enamel density after fluoride therapy. Teeth treated with fluoride in vitro do not produce a more dense enamel surface, unless of course CA ions are present in the in vitro medium.

It is known that agents such as 8-hydroxyquinoline (8 HQ HcL) and chlorohexidine gluconate when applied to the teeth will suppress the adherence of strep mutans to the tooth surface. It has also been demonstrated that ferrous sulphate and copper chloride if applied to the teeth as primers prior to the use of hydroxyquinoline will prolong the Anti-Bacterial property of the tooth surface at least 500%. So the surface tension energy of the

tooth is of much importance. Dreisen and Spies in 1952 found that all 48 specimens of saliva taken from patients contained copper in values from 10-47 MG/100cc. Nature no doubt uses these minerals to good purpose but exactly how oral physiotherapy would affect the surface tension energy of the enamel surface can as yet be only speculative.

Broadly speaking, we have known for many years that saliva being the medium which bathes the hard and soft tissues of the mouth must of necessity play a key role in oral health, what we have been unable to do until the advent of the chewing brush was to increase parotid salivary flow by natural methods.

As Fungi and Bacteria Poliferate best under static conditions - the chewing brush by altering PH, flow rate and temperature of saliva disturbs the equilibrium of bacterial plaques and nullifies their toxicity.

Saliva has been known to possess a bacterial aggregating factor, a mucoprotein, coming probably from the mobile mucous phase of saliva. Hay isolated this high molecular weight component, which promoted the aggregation of a number of plaque forming organisms. The chewing brush besides producing immunoglobulins and proteins from parotid saliva which inhibit bacterial attachment, would also help to dislodge any bacterial aggregating factor.

MINIMISING MICROBIAL ATTACH BY PHYSICAL CLEANSING

Tooth Brush usage is directed towards plaque removal from teeth and attached gingivae. - The chewing brush also removes stale mucous from all mucous membrane surfaces - Parents frequently cause traumatic ulcers on young children when brushing their teeth - the bristles occasionally penetrate the mucous surface with resulting ulceration.

People with active oral musculature utilize their tongue to clean the oral mucous surfaces. Children tend to be lazy in an oro musculature sense and leave an accumulation of the mobile mucous phase and salivary debris consisting of epithelial cells, orogranulocytes, orogranular cell remnants, epithelial remnants, bacterial rods, miscellaneous particles covering the attached and unattached gingivae.

As Klinkhamer has pointed out, it is the musculature of the body both voluntary and involuntary which moves the mucous secretions of the alimentary tract. So as adults, we have learnt to call upon our facial musculature, tongue and cheeks and by sucking saliva from stensons duct to help clear our mouths of debris after eating. - This process, removes a large percentage of stale mucous secretion all over the mouth - the chewing brush cleans away these secretions very effectively. When we consider that the stale mucous secretions are the precursors of plaque the value to oral health in removing them can be readily understood.

The epithelial cells on the labial surface of the attached epithelium have a life span of 7 days - those on the lingual surface 11 days. And so it is important for the dead cell covering to be continuously removed to encourage a more vital life cycle in the underlying epithelial cells, keeping in mind that all oral epithelial surfaces are absorbers of circulating salivary products. The capacity of the oral epithelium to absorb, can effectively be demonstrated clinically by topical anaesthesia. The chewing brush helps remove the old epithelial cells and stale mucous, ensuring the new epithelial cells are bathed in fresh parotid saliva. The growth of pathogenic bacteria in the mouth is very much dependant on an immobile environment - oral physiotherapy mobilizes all the tissues.

NUTRITION

It is not possible to speak of healthy gingivae, without paying due regard to nutrition. Sulcular epithelium not being vascularized, must receive its nutrition by diffusion from the underlying dermis.

The exact nature of nutrient materials such as amino acids, polypeptides, proteins, sugar amines, vitamins, which diffuse, are as yet unknown nor do we know whether gingival conditions blocking the diffusion of one nutrients would block the diffusion of all nutrients. But all clinicians are very much aware that any stimulation of the gingival tissues, whether by toothbrush or interdens or even the finger, causes better metabolism and more healthy gingival epithelia. The alveolar bone is the chief supplier of blood to the periodontium and so it is the chief supplier of nutrition and thus the closer the sulcular epithelium to the bony interface the less the distance that nutrients have to diffuse. We notice that bulky gingival margins are unhealthy margins because nutrients find it more difficult to diffuse from the microvasculature to the crevicular epithelium.

It has recently been demonstrated that in grafting procedures from the palate to say an area on the facial aspect of the lower anteriors that the graft works best when the recipient bed is denuded of all tissue, including the periosteum, demonstrating to my mind, that the underlying bone is the main supplier of nutrition and host defence cells.

The chewing brush is currently being evaluated by Professor Toyoda Hieda and his assistants, Dr. Masahiro Mine and Dr. Masahiko Yoshihara, at Osaka University Dental School.

Their work has been of a precise nature, dealing firstly with the ability of the chewing brush to remove plaque in young children. In this situation, they have found the plaque removing ability of the chewing brush is slightly better than the toothbrush. However, it is in the field of orthodontics which is currently being evaluated that the most excitement lies. Some very good results have been obtained in correcting premaxillary protrusion. I am sure more will be heard from these research workers in the future.

I am suggesting a change in attitudes towards oral health and - attitudes are hard to change. However, I think that a reasoned case has been put forward to persuade you that oral physiotherapy must, in future, play a significant role in promoting healthy development of the mouth.