BITE AND POSTURE

POSTURE and occlusion in the athletes, Andrea Pelosi

If we have to talk about bites in the odontotherapy field we need, first of all, to clarify which kind of device is meant and, overall, the purpose of its utilisation. The bites we are dealing with, in this job, have to be classified as functional devices with the primary aim of correcting the dislocation of the jaw by putting it in therapeutical position. Be careful not to confuse them with the orthodontic or prosthesistic plaques which may have other ends. The therapy with bite has always, or quite always, to be considered a temporary or provisional occlusal therapy, sometimes diagnostic, which allows the modification, in a reversible way, of the occlusal scheme, which already exists, without intervening massively on the patient set of teeth.This therapy will come before the occlusal one which is final and which will consist in a selective subtraction in cases of slight discrepancy between the arcades, or in a prosthesistic treatment (addition) in cases of greater discrepancy or where prosthesistic exigences are present, as in lack of some dental elements, or finally an orthodontic and/or surgical orthopedic treatment (displacement) in cases where the occlusal problems can be cured in this way. The bites can be positioned on either the upper and lower arcade, the choice depends on the kind of bite or more often on the kind of occlusal problems, we usually prefer to use lower bites. We can make a distinction between bites, that's to say BITES OF RELEASE and BITES OF REPLACEMENT.

Bites of Release

The aims of a bite of release are:

- deprogramming of the chewing muscles
- elimination of the proprioceptivity
- muscular relaxation
- functional positoning of the jaw

This kind of bite is also used to correct some parafunctions, (grinding or bruxisme and shutting).It could represent the first kind of occlusal apparatus to be used and then followed by a more complex occlusal therapy with a replacement bite.

Bites of Replacement

The utilisation of this kind of bite can follow the therapy with the bite of release or it may even be the kind of bite used on first remark. It has to be applied in case of important mandibular dislocations and in association with a research of the therapeutic position carried out with the various methodologies which are at our disposal. As far as the programmation of any therapeutic procedure is concerned the presence of a mandibular dislocation in position of maximum dental intercuspidation represents the first aspect to be considered. For therapeutical position we mean a correct and symmetrical spatial relation between the upper and lower arcades together with a correct vertical dimension with a balanced bilateral muscular activity and an acceptable function of articular dynamics. The replacement bite share the same aims of the release bite plus some others which could be defined orthopaedic aims, as the changement of the position of the condylus in presence of incoordination of the convex meniscus or the correction of more complex articular pathologies as the locking and degenerative arthrosic pathologies.Each kind of bite must be in possession of some technical and clinical requirements, as well as the perfect correction of the occlusal defects.

Technical requirements:

- simplicity in the construction technique
- swift laboratory times
- economicity of the employed material
- possibility of bringing modifications and corrections in an easy way and in a short period of time

Clinical requirements:

- least possible obstruction in the mouth
- easiness in fitting it in and out
- good retention without panning
- slightest stress on the teeth
- good dimensional stability
- contact areas well smoothed
- outlined in a way which respects gum and mucous membrane
- round edges to avoid tongue ailments
- possibilityof a good phonation and deglutition

Utilisation of the bite for postural problems

To determine the source of a postural pathology we have to carry out kinesiological tests which allow us to evidentiate if the structural problems are mainly ascending or descending, that's to say of primary competence of the dental surgeon or of the physiatrician, osteopatist or chiropractician. As far as we, dental surgeons, are concerned it has been by now recognised and ascertained the role that the stomatognatical apparatus has in the posture of the body and which postural problems interfere on a correct posture.

Definition of posture

For ideal upright posture (in absence of a pathology) we mean the anatomic position which we assume when we are standing up with the face turned ahead, and the upper limbs aligned to the hips. The planes and the axes of movement are described and defined according to this position of reference; this represents the zero position to measure the movements of the majority of the articulations. To keep this vertical position, feature of the human species, there is a muscular activity called tonic postural activity, which is different from the basic muscular tone and which through muscular reflexed contractions or better repeated isometrical antagonist contractions, keeps the body in the correct posture. This activity has to be considered a motorial reflexed activity which utilises sensitive-motorial ways, complex and multiple, and which is regulated by a complex system of afferences and efferences. The stomatognatic apparatus is integrated in this complex system and it influences and is influenced by the whole postural apparatus.

The starting point of the system has to be seeked in the receptive system. The mechanisms which assure and regulate the postural activity are independent from the will and they utilise sensory-motorial nervous systems at various levels; it is the case of a unity of reflexed activities whose information comes from different receptors through, more or less complex, nervous circuits and their task is that of regulating the tonic activity of the muscles, the limbs and the rhachis and the width of the movements of the different articulations. As well as the segmental peripherical mechanisms, the labyrinthine system and the over-segmenting centres (reticular formation, cerebellum, fundamental ganglions, cortex), the extrinsical ophthalmic musculature and the various elements of the stomatognatic apparatus (trigeminal system), take part in the regulation of the orthostatic postural activity. The postural tone is guaranteed by reflexed circuits which utilise the proprioceptive afferences which come from the various osteo-arthro-muscular receptors.

These receptors are basically:
• Neuro muscular fuses
• Organs of the tendons of the Golgi
• Corpuscles of the Pacini
• Free terminations
• Cutaneous receptors

These afferences are sent to the spinal marrow or to the trigeminal system (specific nucleuses as the mesencephalic nucleus of the V and the overtrigeminal nucleus) through the sensitive afferent fibres, and, as well as activating the segmenting reflexes, they give life to somatopical projections on the overspinal centres. The proprioceptive afferences constitute a real chain of information which comes from each part of the body and the cefalic sector appear particularly important thanks to the stomatognatical afferences. The centres appointed to the postural control elaborate, with this multisensorial information, postural strategies suitable to keep the servo-control of the whole system. The muscular contraction is the fundamental feature of each muscular activity. There are two kinds of contraction: -phasic contraction, execution of rapid movements; -tonic contraction , execution of slow movements. The posture is regulated by the tonic contraction. This tone is kept by asynchronous discharges of impulses from the motorial neurones and is broken out by proprioceptors of the muscle itself through reflexed way. The stomatognatic apparatus is particularly rich of proprioceptors; we have to remember that the innervation comes from the V cranial nerve or trigeminus. The neuromuscular fuses are abundant in the raising muscles of the jaw and are scarcer in the lowering ones and it is for this reason that the proprioceptive activity of the raising muscles has to be considered a primary factor in the control of the position of the mandibular movements. The activity of the neuromuscular fuses is influenced by the central nervous system through the g fibres and particularly by those impulses which come from the reticular substance, and which provoke a shortening of the fuse making it more sensible to the stretching. As the reticular substance is linked to the function of attention and vigilance the activity of the neuromuscular fuses is exalted in those patients who are tense and nervous, with an increase of the muscular activity in posture. Organs of the Golgi are present in the tendons of all the chewing muscles, but especially in the masseter and in the temporal muscle, with the main function of pointing out the variations of the tension with a very low threshold of excitement.In the articulation there are capsuled and not capsuled receptors and free terminations. These receptors are mainly gathered together at the rear part of the articulation, (area innervated by the auricular temporal nerve), they are mechanoceptors both at rapid and slow fitting, and inform both on the position of the articulation and on the variations of load. The dental, parodontal, gingival receptors are also very important, they are present either as free amielinic and crowned terminations than as ring spiral receptors, simple and compound, which are able to record forces exerted over the teeth both in a vertical and horizontal direction with a threshold of 1-5 grams, and for the movement, of 2-3 microns.This information reaches the various nucleuses of the trigeminus. The convergence of this proprioceptive information in the motorial centres and on the relative spinal circuits allows a sery of controls reflexed on the posture of the stomatognatical apparatus and on the one of the whole body. Lowering the jaw we have a stimulation of the neuromuscular fuses of the raising muscles which provokes their contraction through the reflex of stretching or mandibular shutting. The mandibular postural position, thanks to the various nervous connections, is able of modifying the electrical activity of the cervical muscles and the paravertebral ones. In position of maximum intercuspidation, in which the alveolar receptors discharge, we can assist to remarkable variations of the electrical activity of the trapezial muscles and the paravertebral ones until the level of the 4* thoracic vertebra. During the retraction movements we have an increase of the electrical activity at the level of the 7* thoracic vertebra , and during the movements in laterality we have a variation of the electrical activity at the lumbar muscles. As a consequence, the chewing muscles vary their electromyographical activity according to the functional state of the postural muscles. The rear flection of the head increases the activity of the masseter muscles and the digastric ones, while the reflection increases the activity of the temporal muscles. By means of experiment, some French collegues

have evidentiated an homolateral oculo-motorial distony and an ailment of the orthostatic postural activity following an unilateral anaesthesia of the trigeminus in its mandibular ramification. During successive experimentations it has been possible to notice other, homolateral and counterlateral, oculo-motorial distonies with ailments of the postural tonic activity (through stato-kinesimetric recordings and dinamic tests, as the test of Fukuda) after stimulation and then dental anaesthesia. It has been possible to observe alterations of the posture of the head and the body and oculo-motorial disorders in subject afflicted with bruxisme, locking or shutting and myofacial troubles; these disorders did vary with the changing of position of the jaw. The utilisation of the bite in the diagnosis and in the therapy of these postural pathologies could represent the winning choice for several reasons: it modifies the occlusal afferences without bringing irreversible alterations as in no wise are the teeth modified, it is done rapidly, it is an economical therapy and we can even say that it has a zero biologic cost.

Diagnostic and therapeutical procedure

The patients who come to us, under our observation, can present a varied symptomatology. The pain could be limited to the articular and temporal area (disfunctional syndrome of the TMJs) or could interest other districts with cephalalgia, pain in the rhachis (cervical, dorsal and lumbosacral) and the limbs, or, as it happens more often, in presence of a disfunctional syndrome of the jaw associated with postural pains. Very often this kind of patients presents anxious-depressive syndromes too. The therapy for these anxieties isn't, of course, of our competence, but we have to consider that their effect brings on a general increase of the muscular tension, (chewing muscles included), bruxisme and shutting or locking; we have to keep in mind that these parafunctions in patients with a pathological occlusion, can provoke an amplification of the symptoms. Our mistake, in this situation, could be the one of keeping in therapy those patients who believe to resolve their nervous disorders treating a consequence and not a cause, while we, dental surgeons, can just minimize the damages of the chewing apparatus and then suggest a good psychological therapy.

Anamnesis

It is absolutely necessary to get an anamnesis, the most accurated as possible, which takes into account either the problems of the stomatognatical apparatus than those more general and the postural ones, it is important to consider all the traumas, and not just those of the cephalalgic district; a slash of whip, for exemple, could be the unchaining event of an TMJ pathology. As we have pointed out before the mental condition can have great influence, so we need to make questions concerning eventual, past or present, nervous breakdowns, easy irritability, sleeping disorders, use of tranquillizers or psychodrugs in general, and verify if the symptoms did turn up in a period of particular tension and if the symptomatology did become acute in periods of grait stress. Then we have to consider the pain and the parafunctions. As far as pain is concerned we have to value the primary area and the area of diffusion, its intensity, the moment of its appearance, that's to say when it showed up, and the causes which can provoke it or just modify it. As well as parafunctions like bruxisme and shutting or locking we need to investigate even on bad habits, like the suckling of the finger, of the cheeks and an aberrant deglutition.

Examintion

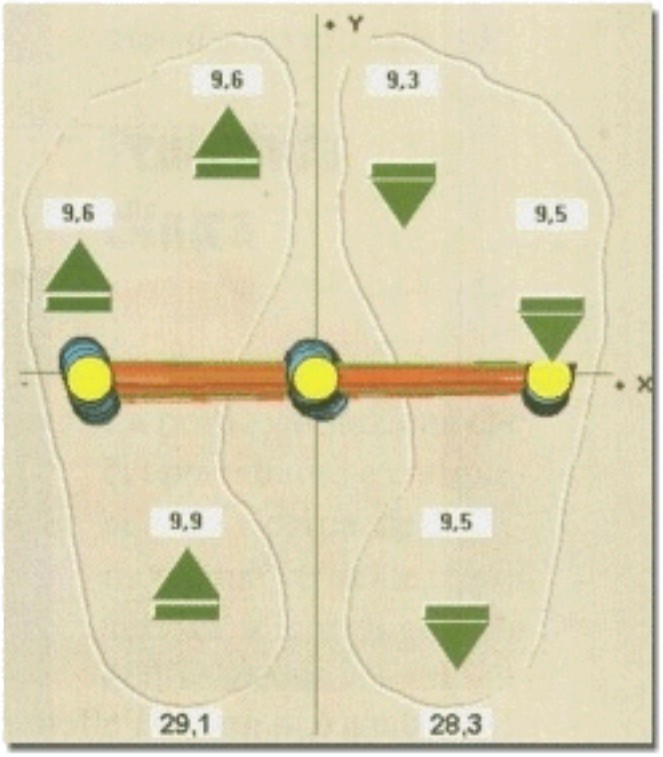
First thing first let's look at the patient's face in upright position to evidentiate eventual asymmetries of the face and the posture of the head, of the neck and of the shoulders. We have to examine the patient with his/her mouth in position of rest and his muscles relaxed;then we ask him to shut his mouth until the first dental contact and then to shut harder. The asymmetries are often slight, but sometimes are so evident that it is easy to make a diagnosis at first sight. Then we see if there are eventual parafunctions which could have caused muscular hypertrophies. Let's then pass to a first test about dental relations which will be completed at the moment of the dental analysis, now we limit ourselves to the observation of evident wrong occlusions, for exemple 2 or 3 classes of Angle with deviation of the median line in position of maximum intercuspidation: in presence of asymmetries this data will confirm the diagnosis of mandibular dislocation. The asymmetry of the face, as a consequence of a mandibular dislocation, comes always together with a changement of position of the lower median line towards the same dislocation side. Then we pass to the palpation to point out the algic spots in correspondence with the emergence of the cranic nerves of the ATM and chewing muscles. The nerves we are going to examine are the overorbital and infraorbital ramifications of the trigeminus. The palpation of the ATM is done on the lateral pole of the condylus on the retroauricular and intraulicular spot through the acustic external meatus; this has to be done with closed and open mouth. The palpation of the ATM has to be considered together with the auscultation (listening) of the same one. The manoeuvre of palpation of the muscles has, for us, a very important diagnostic value: all the chewing muscles can be examined both intraorally and extraorally, and this has to be done with the greatest attention, not to create faulse positif data. The test has always to be done symmetrycally, comparing the homologous muscles on the left and on the right sides, with the mouth open and then closed; it is by looking at the existence of eventual pain differences between homologous muscles on the right and left sides that we can come to a functional diagnosis of the mandibular dislocation. This test, together with the auscultation (listening) of the noises, will allow us to look for the therapeutical position. The listening of the articular noises is important as it can give us indications about the interarticular functionality: we have to look for the kind of noise, their intensity and the moment of their appearance. The noise of a clear and short crack is often symptom of dislocation and condylus-meniscal uncoordination and it is followed by a deviation of the opening movement. The moment it verifies itself, tells us if the uncoordination happens at the beginning of the movement or at the end. If the noise is at the beginning and is slight it usually means that we are dealing with a less serious pathology: we can deduce that the meniscus and the rear ligament aren't seriously damaged. It is useful to make the patient open in maximum aperture and close in protrusive, and make him do some movements to let him notice that in presence of a condylus-meniscal uncoordination the click desappears. We can do the same

with thicknesses of different highness between the teeth to understand if the increase of vertical dimension sets the condylus back on the meniscus. Several repeated slight clicks, distributed all along the movement, are indicatives of morphological alterations of the loose and/or hard articular tissues, and can be, in more serious cases, noises of rubbing or of sand; these lasts are pathognomonic of a degenerative lesion of the articular tissues and they don't desappear neither in protruse position nor lifting the vertical dimension. In presence of uncoordination and serious articular noises the radiographic tests are indispensable. The most simple ones, as the stratigraphies of the ATM at open and closed mouth or x-rays done with transcranial techniques, are usually enough to verify the morphological alterations which will receive an appropriare therapy. The last thing to be done is a proper and careful analysis of the static and kinetic occlusal relations. The occlusal test is done starting from the position of maximum intercuspidation and recording the overjet, overbite values at incisor level, the presence of wrong occlusions (deep bite, inverted bite, open one, etc.), the kind of occlusion according to the Angle classes, the position of the lower median line in comparison with the upper one. The number and the disposition of the dental contacts can be verified with occlusal papers. We make patients do movements of laterality and protrusion verifying the dental contacts, paying particular attention to the interfering contacts. We also measure the extent of the excursions in protrusive and in laterality.

Postural check
The dental visit is followed by a postural visit which is done with a posturometric and stabilometric board and also a postural analysis carried out behind a plumb-line and another device which measure the scoliosis. The postural analysis allows the therapeutist to value at sight the patient situated behind the plumb-line, with the aim of establishing the patient position compared to an ideal position.
The ideal position has to be checked on three planes:

• The sagittal plane where the segments of the body will be bent or extended
• The frontal plane where the segments of the body will be adduced, abduced, leant in convexity or in concavity, lifted or lowered.
• The horizontal plane or transversal plane where the segments of the body rotate (Kendall).

For the posturometric and stabilometric test the patient is placed on the board and is asked to keep an upright (and relaxed) position and to stand still for a given period of time. The board connected to the computer records and works out loads and oscillations. Computer data put into evidence the projection to the sol of the postural loads, their value on both feet, the general state of the barycentre and the state of the barycentre of each limb. A first recording has to be done (with closed mouth and contact between upper and lower teeth) before doing any other things on the patient. If after the Kinesiologic inquiry we notice causes of unbalance, for exemple in a suspect descending oral problem, we separate the dental arcades with cotton roller, and we repeat the test with the board. In presence of a descending oral problem we'll have that the postural and stabilometric result of the second test will be changed, compared to the first one, towards a situation of better balance, instrumental confirmation of our Kinesiologic test.



The posturometric and stabilometric board can be separated and orientated and is made up of two semi-board of support which can be separated and orientated to adapt to the patient physiology; it points out the weight distribution of the subject on both feet, particularly on three specific areas of the foot: 1* metatarsus, 5* metatarsus, heel. The

sensories are cells of load particularly sensible to the weight variations and are able to make up to a maximum of 60 measurements per second for each cell.
During the test it is possible to see the following things on the computer:

The distribution of the loads with the relative values according to the above mentioned points, and the total distribution of each limb
The valutation of the normality of the load meant as a per cent variation and the relative trend.

The position of the general barycentre and the barycentre of each limb, second by second, and the mean value at the end of the test.

It is possible to examine other tables which give, for exemple area, speed, length, variation of the stabilometric ball. The board is able to carry out different valuations too; these will be treated on future occasions.
Preparation of the bite

Once the diagnosis of mandibular dislocation in habitual occlusion (habitual pathological occlusion) is made we need to take the patient into his therapeutical position or in his habitual, not pathological occlusion very quickly.
This can be obtained with an occlusal plaque or bite of release or bite of replacement. Our suggestion, for those cases of mandibular dislocation without severe condylus-meniscal incoordinations or more complex articular pathologies, is a release bite placed in the lower arcade, printed and rebased in the mouth. These bites are usually made of rigid acrylic resins according to laboratory techniques at high or at low temperature; as far as high temperature techniques are concerned the bite is first made of wax and then transformed into resin, in the case of low temperature techniques the material is directly placed on the models by addition and then the excesses are filed.

The resin is from 1,5 to 3-4 mm. thick in occlusion and from 2 to 5 in the other areas. Dr.Zucchi has been the first to introduce the concept of bites which show rigidity features on the occlusal side and elasticity features on the dental side, printing bites using compound material. Between those materials which have been tested for the preparation of the bites with such features, the choice fell on disks of thermoplastic material made of two layers of different hardness, one of soft silicone and the other of rigid plastic material. These disks are of variable thickness, the thinest measure 1,8mm., the medium 3mm. and the highest 4,5mm.; it is also possible to use disks which are only rigid , 1mm. thick, when it is not possible to increase in a remarkable way the vertical dimension.

Clinic procedure
The first valuation we have to make is the research of the vertical dimension which will be useful to correct the dislocation.

We shall use known thicknesses which we put between the arcades until the reaching of what we consider an optimal distance. In this position we shall also verify the postural changements and the positive answer to the muscular tests. Once the highness we want to give to the bite has been recorded, we can send the models to the technician, who will print a bite of the thickness required by us on the lower model. At this point we shall have a bite with the same thickness on all the teeth and which we'll set in the patient's mouth.

By means of articulation papers we shall retouch until we have a contact on all the teeth.
This contact will allow the jaw to close in therapeutical position: that's to say without slipments. To obtain an optimal occlusal contact we have to rebase the bite occlusally with a self-polymerizing resin directly into the mouth It is important to make certain that the patient closes his/her mouth according to the correct position. Once the resin has set, the bite is finished up giving a correct occlusal morphology, with contact on all the rear teeth and skimming on the incisors. Obtaining a canine and incisive physiological guide.

Postural control with bite
Once the occlusal regulation has been carried out the bite will correct all the occlusal problems, at this point we can proceed to the postural verification. On our file we'll have recorded the data concerning the postural analysis carried out during the first examination and we'll have computerised the posturametric data. Now we have to examine the patient again and compare the new data with occlusal correction with the previous ones. If the occlusal problems did create postural interferences, and our correction has been carried out in the right way, we shall have an improvement of the postural condition.

Clinical cases

Caso 1 - Caso 2 - Caso 3 - Caso 4 - Caso 5 - Caso 6 on the site.

Discussion
With this job we have wanted to evidentiate that even with a temporary therapy as the one with bite, it is possible to correct some interferences which can be the cause of postural ailments, disorders from the stomatognatical apparatus. Very often in the dental practice we just mind to the mechanical aspect of the stomatognatical apparatus, without considering that everything is done into the mouth modifies some nervous afferences which reach the Central Nervous System where this information is worked out and sent to the whole body as nervous efferences. If the afferences are not correct the CNS will try to make up for it, to compensate not to create pathology, and so it will be possible to have an unbalance first and then a pathology, if the NOCICETTIVO stimulus will not cease. We have wanted to retake into consideration, here, the two "homuncoli": the motor and the sensitive ones; this has been done to remember how

much the oral cavity and its linked functions are represented at the level of the cortex, and which is the complexity of the trigeminal system. In several cases the bite can represent the quickest and the most economic therapy and, however, a therapy which does not modify in a definitive way the oral afferences. In some cases, as for exemple in presence of cephalalgia, even a serious one, where all the usual therapies have been tried in vain, that's to say without results, we feel able to suggest the usage of the bite, which, in this case, can be defined " diagnostic bite". If we see an improvement of the symptoms we shall go on with the dental therapy, and even if there isn't any improvement we shall not have created any damage.

The patients who come to us, under our observation, can present a varied symptomatology. The pain could be limited to the articular and temporal area (disfunctional syndrome of the TMJs) or could interest other districts with cephalalgia, pain in the rhachis (cervical, dorsal and lumbosacral) and the limbs, or, as it happens more often, in presence of a disfunctional syndrome of the jaw associated with postural pains. If we have to talk about bites in the odontotherapy field we need, first of all, to clarify which kind of device is meant and, overall, the purpose of its utilisation The planes and the axes of movement are described and defined according to this position of reference; this represents the zero position to measure the movements of the majority of the articulations. The starting point of the system has to be seeked in the receptive system.

Organs of the tendons of the Golgi.

Corpuscles of the Pacini.

The posture is regulated by the tonic contraction. The mandibular postural position, thanks to the various nervous connections, is able of modifying the electrical activity of the cervical muscles and the paravertebral ones. The rear flection of the head increases the activity of the masseter muscles and the digastric ones, while the reflection increases the activity of the temporal muscles. Computer data put into evidence the projection to the sol of the postural loads, their value on both feet, the general state of the barycentre and the state of the barycentre of each limb. During the test it is possible to see the following things on the computer: - The distribution of the loads with the relative values according to the above mentioned points, and the total distribution of each limb; The valutation of the normality of the load meant as a per cent variation and the relative trend.The position of the general barycentre and the barycentre of each limb, second by second, and the mean value at the end of the test.