Occlusion, Mastication and the Temporomandibular Joint

Dr. C.J. BOFFA BChD, B Pharm., FICD.
DENTAL SURGEON

The value and importance of mastication and biting forces in helping to promote digestion of food is well known. Being edentulous does for most people lead to restriction of diet with its ill effects and lack of enjoyment of food. The provision of dentures is also a functional necessity in relation to a healthy temporomandibular joint (TMJ). In practice, we find that in many patients, the TMJ adapts itself to a fair amount of varied postures, especially in those who have been without dentures for a period of years. However, changes or deviations from the normal movements of the TMJ introduce risks to its well being.

Some years ago, I carried out practical experiments and observations on a number of middleaged Maltese, with a view to establish a relationship between gape and opening force. Although I did come to some conclusions, these studies are not easy because of TMJ morphology. In contrast to near linear changes in muscle length associated with movements at simple hinge joints, mouth opening in us humans, involves some rotation and translation of the condyle.

Unfortunately, many patients procrastinate to have dentures fitted, without realising the problems they may create for themselves with the passing of time. Although the number is gradually decreasing, we do see patients - who because they did not have dentures fitted at the right time, sometimes for many years, may have very shallow and atrophied gums resulting in poor denture tolerance and angular cheilitis. In cases where there is little bone and gum support, denture tolerance can be difficult. This is further aggravated in nervous, tense or diabetic patients.

Jaws without supporting teeth or well occluding dentures tend to lose their physiological rest position. The facial muscles and supporting tissues may also be effected. In the physiologic rest position of the muscles, both the depressor and elevator muscles are theoretically in balance, so that the jaw is normally in the same rest position - about 2 to 4 millimetres from tooth contact.

Abnormal occlusion is one of the aetiological factors or a contributing factor in certain TMJ conditions. Patients should be encouraged as indeed they often are, to have partial dentures or some other form of artificial teeth fitted where missing teeth are present - these often stabilize the bite, besides supporting the remaining teeth.

It is relevant to mention that measurements of maximum biting force have been used clinically in scientific studies in a few European Centres, to establish face height in denture construction and in the assessment of dysfunction of the TMJ and jaw muscles.

The articles by Goodfriend and Costen published in 1934 were milestones in the field of TMJ disorders. In the light of present day knowledge, it is easy to pick faults in some of Costen's contentions, but he earns our praise for focusing our attention on this important subject. Subsequent and fairly recent research has shown that Costen's Syndrome, as it was then described occurs less frequently and that

one of the disorders which affect the TMJ is a condition which is described by various research graduates as Pain-Dysfunction Syndrome after Schwartz (1959).

Certain problems concerning this condition are not yet solved, but it is worthwhile to consider in brief the effect of occlusion and mastication as one of the aetiological factors. However, there are cases where an irregular occlusion is not the main cause. In several cases which I have seen, four etiological factors overlap - traumatic occlusion, abnormal mandibular movements, anxiety states and generalised muscle tension. In the articular complex, the occlusion, TMJ, ligaments and muscles combine to brace the mandible against the cranial base in several physiological activities. An inordinate amount of brain tissue is allotted to the functions and sensations of the mouth.

Normally, a person's mandibular movements are characterized by his particular protrusive and lateral condyle paths. With normal occlusion, it is observed that occlusal surfaces maintain contact during lateral movements of the mandible. When several teeth are lost without being replaced, the remaining ones are not effectual enough for mastication. The biting load on the TMJ may become unbalanced and overly severe, with a possibility of resultant damage.

Sometimes we observe traumatic occlusions which are asymptomatic. In these cases, it is possible that the adaptability of the patient offsets to some extent the potential harmful effect. It is also an established fact that pain tolerance varies from patient to patient.

Clenching forces may be measured with intra-oral gnathodynamometers and average values for maximum biting forces between the molar teeth of healthy adults are generally between 50 and 70 kg.

When a single leg is missing from a tripod, it becomes impossible to stabilize the object resting on it. If one were to add another leg to a tripod standing on a given plane, this additional leg must extend exactly as far as the plane, lest it lose its function. During the growing stages of a jaw or during the period of changing dentition from primary to permanent teeth, a single tooth could stick out above the rest, forcing the child to take a bite which may be a deviation from the normal occlusion. Normally, however, other teeth grow out to approximate a new balance for the jaw's position.

The bone of the mandible and maxilla is complex in its variations and reactions in different persons. Some bones can resist a reasonable amount of pressure, whereas other bones can resist very little. It is not always appreciated that a properly constructed appliance will aid in the regeneration of bone around teeth as well as aid in their stabilization.

In a study of several Maltese patients, I observed that the Pain-Dysfunction Syndrome affects mostly patients between thirty-five and fifty-five years of age. It appears that women are more susceptible than men, this condition being found more often in those with unbalanced bites and highly strung temperaments. The two important symptoms are pain (often nagging) and mandibular dysfunction which may manifest itself as clicking (various degrees) and irregular movements. The centre of occlusion may be deviated slightly. Pain may generally be either (a) related to the underlying muscles of mastication (myalgia) and the muscles in the cervical region, with possible surface tenderness or (b) related to the joint area, probably due to a traumatic inflammatory state affecting the joint capsule, disc and ligaments.

The recognition of degenerative changes follows integration of a careful clinical examination with the radiographic ones. A contour of the TMJ and associated parts can be formulated, special problems and data noted and partial or full dentures planned to help correct the strain or irregular forces acting on the TMJ. Sometimes a special appliance is required.

Although definitely not the only cause, unbalanced or traumatic occlusion may be one of the causes of tension and spasm in the muscles and strain on the disc-joint-ligament relationship. Furthermore, it is worth remembering that cartilage has no recuperative qualities.

This syndrome may be caused by:

(a) Lack of support or balance between maxilla and mandible due to several missing teeth on one side.
(b) Loss of all teeth and non wearing of dentures for a long period.
(c) Angle's Class II occlusion with lack of support posteriorly.
(d) Overclosure or unbalanced bite in dentures.
(e) Abnormal intercuspal relation which effect occlusal and grinding movements during mastication.
(f) Prolonged grinding, clenching and nail biting in nervous patients.
(g) Abnormally erupting wisdom teeth.
(h) Fractures of condyles
(i) Rheumatoid arthritis.

In a good number of cases, the active phase of pain in the TMJ region stops or decreases when the causative factors are eliminated. It is not a good policy to give an unlimited amount of analgesics for a long period as these may mask or alter the symptoms and may put the patient off from undergoing the necessary investigations and treatment. We must do our best to (a) maintain occlusal equilibration (b) assist the physiologic rest position of the jaws and (c) encourage the patient to relax and cooperate.

One final comment. We differentiate between Pain-Dysfunction Syndrome and Trigeminal Neuralgia. In the latter, severe pain generally comes suddenly, but is of relatively short duration, whereas in the former it tends to be less severe but lingers on as a dull continuous ache.