Orthocranial occlusion and the Accu-liner system

By Bert Rufenach, DD

There are systems for fabricating dentures that are not based on the acron-type articulator (the common hinged articulator). The Accu-liner system is one such system. Its working principles are based on original findings and well-established prosthodontic facts. The Accu-liner Instrument is an orthopedic analyzer/articulator that can be used as an instrument to register and do an analysis of the plane of occlusion, and it can be used as an articulator for setting-up dentures. It uses intra-oral measurements in a way that is different than the way most of us use intra-oral measurements for the hinged articulator. It is a new system and instrument that can measure and relate relevant intra-oral readings and occlusal forces to denture construction that conventional systems do not adequately address.

The author of this system, Dr. James E. Carlson, demonstrates the importance of these measurements to denture construction and their effect on not just the mouth, but also the effects of these forces on the head, neck and whole body.

The Accu-liner Instrument was originated by Dr. Leland Hardy and its function is based on principles of neuromuscular dentistry by Dr. Bernard Jankelson and on a study of more than 10,000 skulls by Dr. Harry Cooperman and Dr. Sam Willard. Their observations determined the relationship between the plane of occlusion and the hamular-incisive papilla plane (HIP plane). They found that the plane determined by the hamular notches and the incisive papilla is parallel to the plane of occlusion on the study of these skulls (figs. 1 and 2). This plane can easily be measured and is a reading determined using boney reference points not soft tissue measurements, such as used in the Frankfort plane, the Camber’s plane (Ala-Tragus plane) or the bipupillary plane (fig. 3). The author of the Accu-liner system has determined that the HIP plane has a greater degree of accuracy in determining the plane of occlusion than when using soft tissue reference point. The HIP plane is also defined as being the true horizontal to the skull with the forces of occlusion being perpendicular to this plane (figs. 4 and 5). This balance of occlusal forces directed to the base of the skull keeps the muscles of the head and neck in balance and associated neuro and skeletal systems in a bilateral harmony and in correct anatomic function (fig. 6). This means that an incorrect bite can have deleterious consequences that go beyond sore spots or difficulty with chewing. It can have serious long-term effects on the correct functioning of the neuro-muscular and skeletal systems (fig. 7). An imbalance of these forces on the temporomandibular joint or TMJ, a very delicate and very avascular joint with very little ability to regenerate, can and will cause serious pathologic consequences to this joint.

The correct and balanced relationship of occlusion and its forces on all parts of the head and neck is called orthocranial occlusion. Orthocranial occlusion and the Accu-liner system is a system capable of doing an occlusal analysis on both natural and artificial dentition, correcting collapsed vertical dimensions and correcting distorted planes of occlusion. The Accu-liner instrument has the unique ability to correctly reposition the head of the condyle in the glenoid fossa. This repositioning movement is a translational move not a rotational move, a feat impossible to do on most Acron-type articulators. Dental specialists involved in TMJ can use the Accu-liner’s unique ability to reposition each temporomandibular joint.
independently in the treatment of their TMJ patients. As denturists, we can fabricate our dentures using Accu-liner’s principles. Many of our patients may have some degree of collapse of vertical dimensions and many have distorted planes of occlusion which can put stresses on the TMJ. It is very important for our profession to take a bite that directs the forces of occlusion correctly through the plane of occlusion when making new dentures. We can do our part to prevent the development of more serious TMJ problems such as jaw clicking, facial pain, neck pain, headaches and most serious the degeneration of the TMJ structures.

The plane of occlusion is not a flat plane but a three-dimensional circular curve with a radius of approximately four inches. All teeth should be set up on this curve(fig. 8). The average direction of forces of occlusion of the teeth will then be perpendicular to the HIP plane. Observations were made on skull studies on the relationship of the anteroposterior curve and the mediolateral curve to the condyle angle and the three classes of occlusion. Class I occlusions had a slope of the articular eminence of 30 to 60 degrees. Class II occlusion had a slope of 60 to 80 degrees and Class M occlusion had a slope of 15 to 30 degrees. This information was then charted and related to skeletal relationship, translational ratio, anteroposterior curve, mediolateral curve, overbite over jet ratio and angulation of teeth. Each class of occlusion was shown to have typical characteristics to keep it in harmony with the stoma-gnathic system. These curves and ratios become the guides for setting-up the teeth for the different classes of occlusion. Although condyle angle and class of occlusion is most accurately established using X-rays, class of occlusion can also be determined using a system of phonetic sounds. From the now established class of occlusion, typical condyle angles can be established for the setting-up of teeth. The Accu-mill is piece of equipment that comes with this system. It allows you to grind a plane of occlusion parallel to the HIP plane into an existing old denture if the plane of occlusion is incorrect. The temporarily corrected plane of occlusion can then deprogram bad habits and unbalanced muscle posture caused by years of
incorrect biting, prior to the construction of new dentures.

Another unique feature of this system is that the upper model is mounted on the Accu-liner instrument establishing the HIP plane before the bite is taken and this plane can then be maintained throughout the bite registration procedures. Lateral skull X-rays can be used as an alternative method of mounting the upper model on the Accu-liner.

Bite registration for this system does not confine you to any one technique. Dr. Carlson describes a difficult but interesting method of establishing the bite using a method called the phonetic protrusive bite but, whatever bite method you use, it must be taken in a neuromuscular neutral position. An easy method of achieving a neuromuscular neutral muscle position can be done by biting on cotton rolls placed between the pivot point of the mandible just prior to taking your favorite method of bite registration.

Impressions are done using a neuromuscular-neutral technique registering all relevant anatomical structures in a neutral position. The anatomical landmarks will then allow you to accurately establish the HIP plane on the Accu-liner.

The setting-up of teeth is outlined in great detail for each class of occlusion. The individual tooth morphology should
also be reshaped to more precisely accommodate the different classes of occlusion.

Another attachment for the Accu-liner is the parallel positioner which allows you to survey teeth for partial dentures and for fabricating templates to allow implants to be positioned parallel to each other. A magnetic attachment is also available to transfer Accu-liner measurements to fully adjustable acron-type articulators should the need arise. The Accu-liner Instrument can also be used for orthodontic analysis, dental splints, crown and bridge, periodontics and pedodontics.

The Accu-liner system is different from most conventional denture systems. Its strongest points are its ability to establish the RW plane which will be used to direct the occlusal forces correctly into the base of the skull, the ability to establish an accurate plane of occlusion and to use this instrument to set up the teeth on this established plane. Dr. Carlson’s manual on the Accu-liner system is a 400-page book with a wealth of information on, not just theory and definitions, but also practical chairside procedures and laboratory techniques that can enhance the practice of all denturists.

Bert Rufenach, DD started a seven-year apprenticeship with his father’s commercial dental laboratory at the age of 18. In 1977, he successfully passed his RDT exams and in 1979, he graduated from George Brown College as a denturist. Bert is currently director of the Denturist Association of Ontario.