“To obtain unilateral chewing stability: forget about balanced occlusion, it doesn’t work, but balanced occlusion is essential during parafunctional mandibular movements to prevent unbalanced loads on the supporting alveolar ridges.”

This blunt statement shall guide us through some critical steps when making complete dentures, overdentures and free-end saddle removable partial dentures. The present article shows how one can achieve optimal chewing comfort for edentulous patients. It takes us back more than half a decade when some renowned prosthodontists made significant observations that led to a new concept, namely a modified lingualised occlusion. Furthermore, it reveals some of the reasons why dentures may fracture when this concept is not used.

The five pivotal points define what is considered essential:

1. Food is almost always chewed on one side only (Hiltebrandt, 1933/35).1
2. During mastication, the teeth of the denture wearer only finally come into contact when the food load has become softened (A. Gerber, 1946).2,3
3. Therefore bi-lateral equilibration is ineffective for chewing stability.
4. For unilateral chewing stability of dentures, immobility is the key.
5. Parafunctional contacts occur during the day and night. In order to distribute resulting forces evenly, correct centric and equilibrating contacts are necessary.

The study from Suguru Kimoto et al4 showed greater satisfaction of the patient wearing dentures with a lingualised occlusion concept. Another
article “The effect of occlusal contact localisation on the stress distribution in complete maxillary denture”, describes the link between stress distribution and broken dentures. According to this study, it is the type of occlusion and the positioning of the teeth in relation to the alveolar ridge, which lead to denture destabilising forces and broken dentures.

1. Functional reasons why dentures break

Incorrect positioning of posterior teeth

From a mechanical point of view, the ideal point of pressure on the tooth is the area shown in Figure 1 indicated with a green arrow. The chewing force is directed onto the middle of the alveolar ridge. Forces directed in a more buccal direction, as the red arrows show, progressively increase the deformation of the denture. The denture is no longer well-fitting (blue area) and in time, could initiate a crack zone in the palatal part of the denture.

Abrasion and centric anterior tooth contact

Also of importance is the mould of the teeth. By losing the main palatal cusps on the maxillary denture, we get more pressure on the buccal cusps. The buccal cusps are further from the midline resulting in greater leverage and concentration of occlusal forces in the palatal area of the denture. This increases the likelihood of crack formation on the palatal part of the denture (Figure 2). Because of the inclination of the occlusal surface, shown in Figure 2, the resulting orientation of the forces, upwards and outwards, increases the deformation of the denture base, which in turn may also lead to crack formation in the denture base and even damage of the alveolar bone.

Usually, we can easily distinguish between a functional breakage and an accidental breakage of a denture by the signs of fatigue associated with functional breakage. Of course, we could also ask the patient what happened. If such a reoccurrence is to be prevented, then it is essential to appreciate the functional origin of palatal fractures.
As posterior contacts wear over time, anterior and canine guidance are created. Although this may be judged to be satisfactory in a natural dentition, in complete dentures this can provoke a tilting action and a subsequent dropping of the denture in the posterior region leading to an unsatisfactory denture for the patient. This tilting action is thought to be one factor involved in maxillary anterior fibrous ridge replacement and fracturing of the maxillary denture.

Conclusion

Broken dentures are a good indication of instability caused by unstable positions or wrong contacts of the artificial teeth. It is in these cases that pathological damage can be caused. We can use high-impact acrylic or just repair the denture, but in both cases, the pathological damage may continue. The results are flabby ridges and increased bone resorption. Masticatory efficiency is very restricted and the patient could experience pain. To avoid these problems we need defined tooth contacts and periodic reviews.

2. Tooth position and denture stability

Many years ago, different authors discovered the problem of the unstable denture (Hiltebrandt 1933, Payne 1941, Gerber 1946). All of them proposed a specific linguisted occlusal concept to solve the problem. In Europe in 1958, Albert Gerber from Zurich developed the so-called “Gerber-Method”. It is still recognised as one of the best systems available today.

Conventional tooth set-up

In the conventional set-up, the mandibular buccal cusps are on the crest of the ridge (or more lingual); in the maxilla, the central groove is straight over the crest of the ridge (Gysi 1914/17). Buccal cusp contact in a conventional set-up during mastication is a handicap. Too much force is exerted buccal of the ridge, resulting in an unstable denture (Figure 3). In a linguisted occlusion, the buccal cusps are reduced (min. 2mm) so the masticatory forces are directed over the lingual-palatal area and the centre of the ridge. In this way, the denture is more stable during mastication (Figure 4). A correlation of denture instability and progressive alveolar bone resorption exists and this correlation may be population specific. A personal observation, made by the author of Japanese edentulous patients, revealed a significantly better situation in comparison with a Caucasian population. Their alveolar ridges appeared distinctly wider and showed significantly less resorption over time. These characteristics clearly favour denture stability. It may explain the reason why Kimoto et al found little or no difference in the mastication performance of edentulous patients when comparing linguisted and conventional occlusal schemes. Long-term results could show different results when the fit of the dentures deteriorate.

The Gerber System set-up

In this system, we position the upper teeth almost vertically on the crest of the ridge (Figure 4). This aids denture stability with the advantage that the teeth can be placed more buccally. This not only provides better cheek contact and more tongue space but also helps prevent it from slipping under the denture.
Figures 8a and 8b. In this set-up, the second maxillary molar is 3mm out of contact. Therefore it is not possible to chew on it. Also, we can observe the large gap between maxillary and mandibular buccal cusps on the first molar.

**The mandibular denture**

The mandibular denture bearing area can have a difficult shape with many differently inclined levels. Everyone knows what happens if you stand on an inclined slope on ice or snow in Switzerland - we slide downhill without any effort, known as skiing! Teeth standing on the retro-molar ascending part of the ridge push the denture forward during mastication (Gysi 1917). Figure 5 depicts a common case. The last mandibular molar is positioned in the area of the retro-molar ascending part of the ridge and the force to the mandibular denture during function is transmitted obliquely to this inclined retro-molar area. The force will be deflected forward and the denture slips down the slope and lifts up at the front.
The maxillary denture

“Can this also happen with the maxillary denture?” Yes!

This case shows that both dentures are unstable (Figure 6). As the patient chews food, the dentures move making it virtually impossible to masticate. Pressure areas are pre-assigned and, with time, provoke resorption of the ridge. Under masticatory force, the maxillary denture slips forward and only the patient’s lips hold the denture in position. This has a negative effect on aesthetics, making the lips appear tensed.

Model analysis

Anyone building a house knows that he has to analyse the ground it will be supported on. When setting up a denture, we need to do the same - we call it model-analysis. We draw the different zones on the side of the model - positive, neutral and negative/unstable areas. We use different colours to get a quick analysis of the situation (Figure 7).

Posterior tooth position

The second maxillary molar in Figure 8a and 8b is 3mm out of contact to its antagonist and therefore it is not possible to chew with it. These last teeth serve only as a support to the cheeks, prevent food slipping up or down under the denture and prevent cheek-biting.10

If sufficient space is lacking, we recommend not placing any maxillary second molars at all (Figures 9a and 9b).

Conclusion

Tooth position is a main contributing factor to stabilise dentures. Each tooth needs to be set-up such that functional forces are directed to the respective ridges and press the denture base orthogonally on the mucosal surface. This is also referred to as unilateral, multi-local chewing stability, i.e. dentures will be more stable when biting on just one side.

Part II of II

In part II we deal with the concept of balanced occlusion, establishment of centric relation and the use of an articulator that enhances functionality in denture wearers.

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