

The Innobyte™ – An Innovative Way to Record Bite Forces

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Fig. 1 - The Innobyte™ device

Last year, I viewed a webinar introducing the Innobyte™ bite-force measuring device developed by Kube Innovation, Montreal, Quebec (Fig. 1). As a dentist, I have often wondered why some patients struggle to achieve improved masticatory function with new full and partial dentures, while others seem to wear out their denture prostheses in a short time. In the past, I had some exposure to the T-Scan™ device by Tekscan™, South Boston, USA, which shows when each tooth comes into contact and identifies prematurities or occlusal abnormalities.¹ I was very intrigued by the Innobyte™ device because it records and quantifies the gross occlusal forces applied by various combinations of remaining dentition and denture prostheses, such as complete and partial dentures and implant-retained/implant-supported dentures.² So, I purchased my Innobyte™ in April 2021 and have greatly enjoyed this fascinating tool.

Before proceeding further, please review the following three statements:

1. I'm not receiving any financial compensation for this article.
2. I'm not presenting a scientific study. Instead, I'm sharing my personal experiences using the Innobyte™ in my denture clinic.
3. All Innobyte™ readings and pictures are authentic, and I recorded them with each specific patient. The Innobyte™ images have been updated for clarity purposes.

How to Use the Innobyte™

It takes little effort to use the Innobyte™, but it does require patient cooperation. The patient relaxes in an upright position (Fig. 2). Next, slide a clear plastic barrier sleeve over the blue silicone bite fork, turn on the control unit, and insert the self-seating bite fork intra-orally. Place the upper incisors against the protruding stop, then have the patient close slowly (Fig. 3). Once the teeth occlude, have the patient bite on the blue fork. Repeat this process three times. To record the maximum biting force, allow a 3-second break between each recording. Remove the device and view the occlusal bite registration displayed; the top line reads the maximum bite force recorded. You may repeat if you have any doubts. This entire process takes a very short time, and so far, none of my patients have objected to this procedure.



Fig. 2 - Using the Innobyte™



Fig. 3 - Intra-oral position

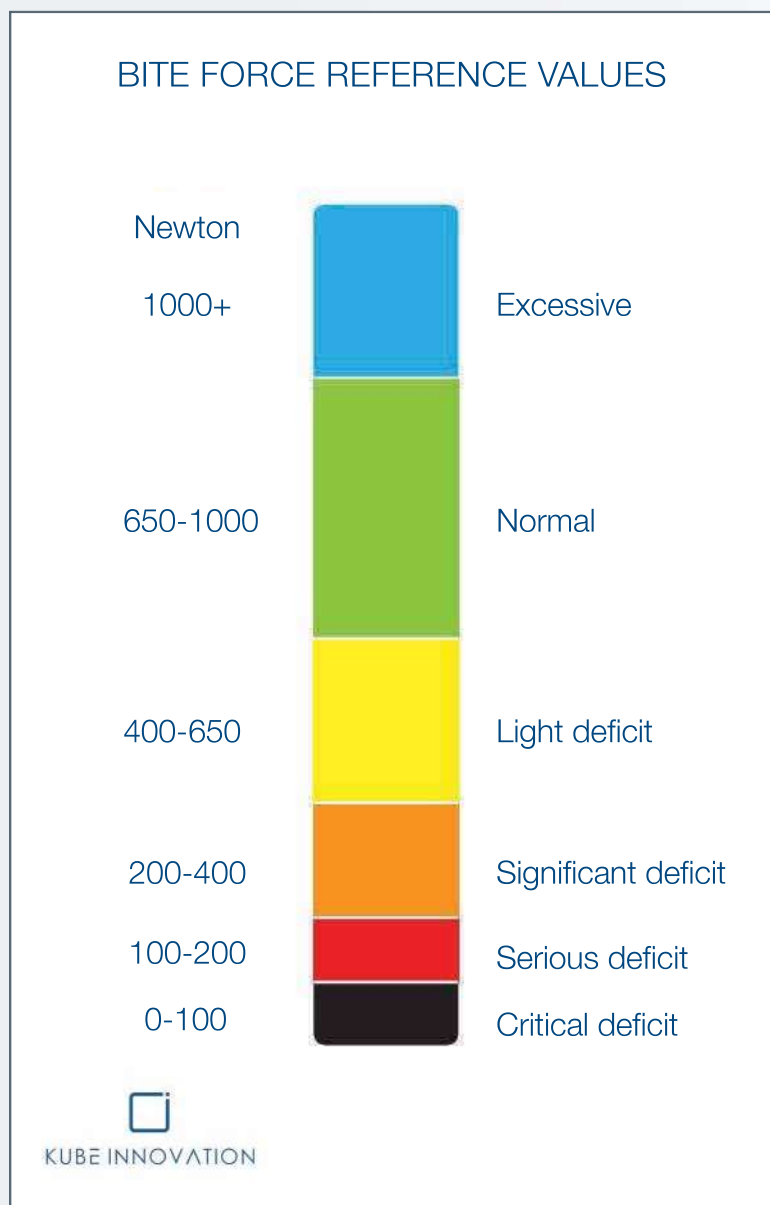


Fig. 4 - Bite Force Chart

How to Evaluate The Innobyte™ Results

The bite force registration procedure identifies occlusal forces from severely deficient to excessive. The Bite Force Reference Values chart (Fig.4) identifies bite forces from 0 to 1000+ Newtons (N). The lowest value from 0-100N indicates a critical deficit, 100-200N is a serious deficit, 200-400N is a significant deficit, 400-650N is a light deficit, 650-1000N indicates a normal function, and forces above 1000+ Newtons are excessive.

Of course, once my Innobyte™ arrived, my denture clinic team and various family members were tested to identify their occlusal forces. My dentate bite force is excessive at 1200N, and, yes, I wear a nightguard to protect my teeth from parafunctional forces.



Fig. 5 - Max Bosshart's book

Thoughts and Questions

I recently read a fascinating book by the Swiss master dental technician Max Bosshart, titled *Funktion & Ästhetik*, published by Quintessenz Germany (Fig. 5). He quoted a study by Muller et al. examining the maximum bite force after replacing complete dentures. The results indicated that the maximum bite force (MBF) tended to be impaired when replacement dentures were first fitted.³ However, this trend reversed for patients with moderate lower ridge resorption during the first month. Patients with more severe lower ridge resorption showed a significantly lower MBF over the entire observation period and took longer to regain bite strength. Only patients with moderate bone resorption exceeded their pre-insertion level of MBF within the observation period of 6-10 months.

Based on this study, it makes sense that many edentulous patients struggle with their new dentures. Over the past eight years, I have sought many educational opportunities to learn how to create more stable and better-fitting dentures. I have trained extensively with Dr. Jiro Abe from Tokyo, Japan, who developed the Suction Effective Mandibular Complete Denture technique (SEMCD). As a result, I have become a SEMCD clinical and technical instructor and a Biofunctional Prosthetic System (BPS®) denturist instructor. The BPS/SEMCD technique utilizes closed-mouth impressions to record the oral residual ridges and tissues at rest, thus creating more stable and functional denture prosthetics.

As I'm starting to utilize the Innobyte™ more frequently, I'm eager to record tangible, quantifiable bite force results and how they correlate with anecdotal patient testimonials.

Please enjoy the following patient-specific experiences. Some of the bite force results have been very surprising, while others have confirmed standard treatment recommendations.

Various Patient Experiences

Patient BR's current CUD and PLD are at least 20 years old. He can't eat well and wants new dentures. The oral exam shows an excessive freeway space of 8mm, both prostheses fit very poorly, and the denture occlusion is severely worn. In addition, the initial Innobyte™ recording is 73N, which is critically deficient.

The proposed treatment plan involves removing some mobile lower teeth and fabricating upper and lower precision prostheses. The excessive freeway space is reduced to 3mm, the proper masticatory function is restored, and the patient is happy with his new smile. At insertion, the Innobyte™ measurement is 232N, which shows a 218% bite force increase. I expect further bite force improvement with increased patient adaptation. Unfortunately, he has moved away, which prevents any additional follow-ups.



Upper final impression



New dentures



Pre-extraction situation



New smile



Pre-extraction bite force



Lower final impression



Bite force with new dentures

Is a Partial Denture Essential?

Patient DT has worn the same PLD since the 1980s. As a result, the partial denture occlusion is entirely worn by the opposing dentition, leading to overeruption of the antagonistic

maxillary molars. The initial Innobyte™ record is 611N and increased to 1034N at the insertion of the new PLD, a 69% improvement.



Old partial lower denture



Over-erupted posterior teeth



Initial bite force



New partial in situ



Bite force with new partial



New partial lower denture

How about Immediate Dentures?

Patient KJ is 83 years old, and his remaining dentition is failing. He has decided to proceed with immediate dentures. The initial bite force recording is 490N, indicating a light chewing deficit. After the initial healing phase of six weeks, the new bite force is 156N, a serious deficit and a 67% loss of biting pressure. I firmly believe that

pre-extraction bite force measurements, patient photographs, intra-oral scans, or dental study models are essential permanent records for patients who undergo extensive dental extractions. Suppose the patient is not satisfied with the functionality of his new dentures. In that case, we can review the pre-extraction records to explain the benefits of implant therapy and expectant bite force improvements.



Pre-extraction situation



Pre-extraction situation



Pre-extraction bite force



Dentures in situ



Post-extraction bite force

Does Denture Fit Improve the Biting Force?

Patient DL lost a maxillary anterior bridge, followed by upper dental clearance, and received a single maxillary denture. The resultant

bone atrophy required a permanent reline; the initial bite force before the reline impression was 506N. After the reline impression, the bite force increased to 672N, a 33% improvement.



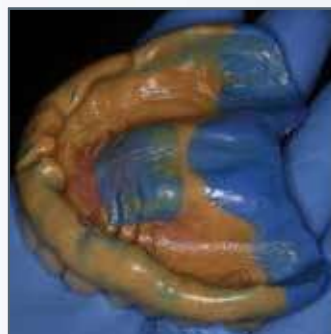
Pre-extraction



Post-extraction



Maxillary denture



Maxillary reline impression



Bite force before the reline impression



Bite force with the reline impression

Why Do Some Patients Frequently Break Denture Teeth?

Patient DN has been wearing dentures for over 60 years. He needs new dentures every five years and frequently fractures denture teeth. His bite force registration is 684N after relines were performed,

which places him in the normal range of dentate individuals. No wonder he wears out his dentures.



Bite force after dentures were relined



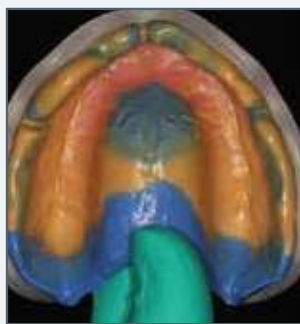
Chipped denture tooth 1.1



Denture tooth 1.1 has been removed



Replaced denture tooth 1.1



Maxillary reline impression



Caption: Mandibular reline impression

How about Implant Overdentures?

Patient MJ has a removable mandibular overdenture engaging a fixed bar. Her maxillary denture doesn't have any implants. She is happy with her dentures and stated, "I can eat anything, apples,

corn on the cob, meat, etc." Her bite force is 319N, a significant deficit, demonstrating how patients can adapt and be satisfied with limited bite forces.



Mandibular fixed bar



Mandibular overdenture



Phonares II denture teeth



Bite force registration

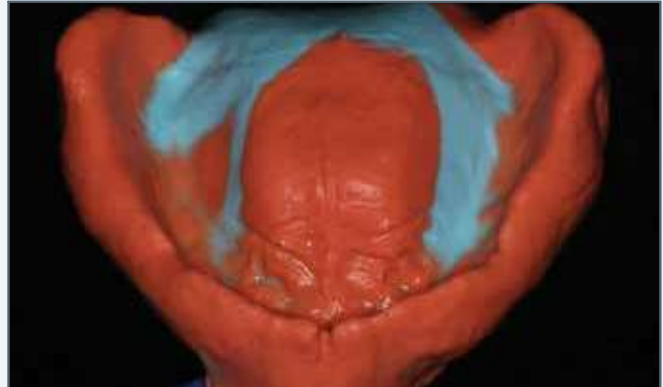
BPS® Precision Dentures with Two Mandibular Implants

Patient TS is 36 years old and visited my clinic in February 2021. His remaining dentition was in poor shape; he experienced severe overclosure, vertical bite collapse, and lacked posterior occlusal contacts. Full dental clearance was performed, including alveoplasty to level the remaining ridges, and two mandibular implants were placed. The BPS® precision denture process was

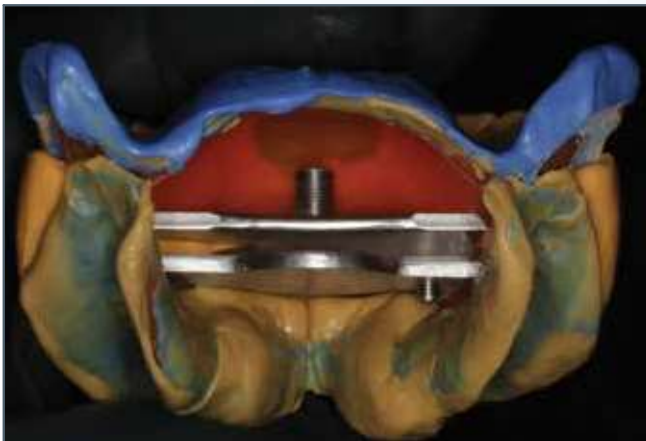
applied, including Accudent XD preliminary impressions, followed by gnathometer CAD closed-mouth final impressions. At insertion, the bite force was 405N; two months later, it increased to 529N. The maxillary denture required a tissue conditioner three months later, and the occlusal force improved to 768N. The bite force increased by 90% between insertion and the latest follow-up.



Pre-treatment



Upper preliminary impression



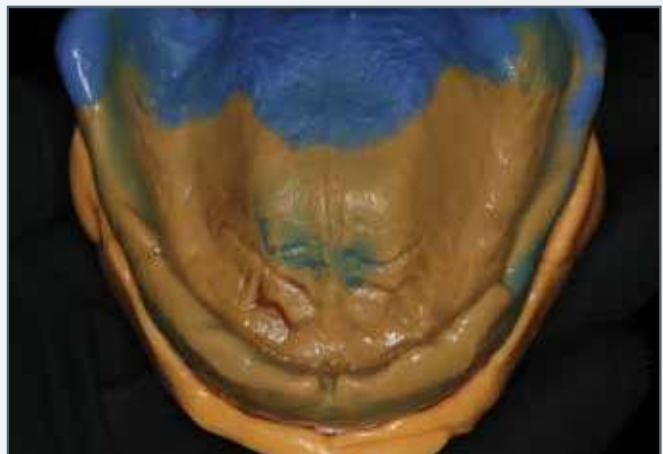
Gnathometer CAD gothic arch tracing



Lower preliminary impression



Mandibular final impression



Maxillary final impression



Finished dentures



A new smile

Conclusion

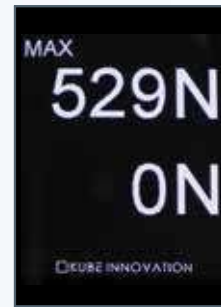
Having dentures is a dental disability! As denture care providers, we fabricate denture prosthetics with many inherent limitations. The more information we have, such as current bite force measurements, helps us address patient expectations and present improved treatment options, such as implant therapy. We make dentures, but we can't perform dental miracles! The Innobyte™ is a significant investment but, in my opinion, an essential diagnostic and treatment planning tool. ▀

References:

1. www.tekscan.com.
2. www.kubeinnovation.com.
3. Muller, F, Heath MR, Ott R. Maximum bite force after the replacement of complete dentures. Gerodontology 2008; 18:58-62.



Bite force at insertion



Bite force after two months



Bite force after tissue conditioning



Markus Fischer was born and raised in Germany, immigrated to Canada in 1986, and trained as a dental technician in 1993. He expanded his skills and became a denturist in 2006. Markus is passionate about denture education and was the first Canadian denturist to train with Dr. Jiro Abe. He is a BPS® and SEMCD instructor and resides with his family in Mission, BC, Canada.