# What's new for the clinician – summaries of recently published papers (November 2024)

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## 1. THE SINGLE MANDIBULAR IMPLANT STUDY – IMPACT ON DIETARY HABITS AFTER 5 YEARS OF OBSERVATION IN PATIENTS WITH IMMEDIATE AND DELAYED LOADING PROTOCOLS

Currently, the standard of care for patients who are edentulous and reside in mainly developing countries is a set of conventional complete dentures.[1] The retention and stability of these dentures is highly influenced by the existing anatomical supporting tissue, the adjusted tooth set-up and a targeted extension of the denture base into the muscular functional spaces.[1] Due to atrophy of the mandible and reduced supporting tissue compared to the maxilla, there are limits regarding a sufficient retention and stability of complete dentures in the mandible, which can directly influence dietary habits and patient comfort.[1]

The use of oral implants has been found to increase the stability of these prostheses.[1] As early as 2002, the Mc Gill Consensus Statement set implant-supported complete dentures on two implants to be the standard and first-choice therapy for the treatment of edentulous mandibles. Unfortunately, the cost of implant placement made this viable only in the well-resourced developed countries.

For prosthetic and anatomical reasons, the intraforaminal region is an excellent position for a simple implant insertion. The absence of a nerve canal and adequate vertical residual bone height even in advanced atrophy are advantageous.[1] Suitable retention elements such as ball anchors, bars and magnets can be used to allow direct attachment to the prosthesis.[1] In some cases, existing prostheses can be modified in this process, even avoiding the need to fabricate a new prosthetic restoration.

A comparison of conventional complete dentures with implant-supported dentures on two implants has shown significant improvement in patients' comfort, oral health-related quality of life, denture stability, phonetics and, finally, increased masticatory efficiency.[1] Depending on the time after implant placement, the implants can be loaded immediately or with a delayed loading. Loading is defined as the direct occlusal contact of the implant-supported denture with the antagonistic opposite dentition.[1]

The retention of complete dentures using only one centrally placed implant in the mandible has also been investigated and demonstrated similar improvement performance to implant-supported dentures on two implants. Similar to the investigations with two implants, studies revealed an improvement in patient satisfaction, oral health-related quality of life and patient comfort.[1] In addition, a significant improvement in masticatory efficiency can be observed here. Blender and colleagues (2024)[1] reported on a trial that sought to investigate the influence of the loading protocol of the implants on a possible change in the dietary habits of patients after a midline implant was inserted in the mandible to support the existing complete denture.

### Methodology

This was a prospective multicentre randomised clinical trial conducted at nine study centres in Germany. Edentulous patients between 60 and 89 years with sufficient and technically acceptable complete dentures in the maxilla and mandible were included, whereby the retention and/or stability of the mandibular denture was assessed as insufficient by the patients. If a new mandibular prosthesis was fabricated, it had to be in situ for at least 3 months to allow adaptation by the patient. For the placement of a single midline implant in the mandible, the residual bone height at the lowest vertical height of the mandible had to range from 11mm to 20mm (according to Mc Garry et al. type II or type III) and the vertical bone height at the midline of the mandible had to measure at least 13mm.

After completion of the screening of potential study patients, a total of 163 patients received a single midline mandible implant (3.8mm x11mm implant). Of these, 158 patients could be randomised into the two study groups. Randomisation took place at the time of implantation directly after insertion of the implant and determination of the implant stability. The insertion torque had to be at least 30 Ncm and the ISQ value had to be ≥60.

To determine the ISQ value, a Smart Peg attachment (type 23) was screwed hand-tight onto the implant (2-4 Ncm) and the implant stability was measured in mesio-distal and vestibular-oral direction using resonance frequency analysis (Osstell ISQ, Gothenburg, Sweden). The implants of patients in group A (n = 81) were loaded immediately, whereas in group B (n = 77) a delayed loading was performed after a defined healing period of 3 months. For fixation of the prosthesis with the ball attachments on the implants, the retention matrices were inserted into the existing mandibular prosthesis with a self-curing bis-acrylate resin, using the chair-side technique.

In order to assess the influence of the implant loading protocol on changes in nutrition intake over time, a corresponding dietary questionnaire was created for the study. This questionnaire was completed by the patients in both study groups at four defined time points: (1) baseline examination before randomisation and implantation, (2) 12 months after implant loading, (3) 24 months after implant loading and (4) 60 months after implant loading.

The first part of the dietary questionnaire was aimed at the patients' nutrition intake. The patients were asked to document how frequently certain foods were consumed. Nine foods and three alcoholic beverages were recorded.

There were seven possible answers ranging from "1 – rarely or never" to "7 – two or more times a day". According to the consumption frequency, the patient could enter the corresponding answer option with a number behind each food.

In the second part of the nutrition questionnaire, the patients were asked whether they actively avoided certain foods as a result of the existing dentures. Eleven foods with different consistencies and textures were submitted to the patients. This time, the patients had to specify whether they consciously actively avoid these foods in their diet due to the presence of the denture. Simple "yes" or "no" answers were possible.

### Results

During the five-year follow-up, 50 patients in group A and 51 patients in group B were re-examined, with one patient in group B having an implant loss. The number of patients in group A and group B was reduced to 47 and 45, respectively, since dietary questionnaire data were available for these patients at all four examination times. For the foods beef, pork, unprocessed cereals (brown rice, cereal, oatmeal etc), wholegrain bread and the alcoholic beverages beer, wine and liquor, neither intergroup nor intragroup differences were observed throughout the study period. At baseline, only the consumption of fresh fruit showed a significant difference between the food intake of the two groups ($p=0.013$). This trend was also observed at 12-month ($p=0.020$) and 60-month ($p=0.045$) follow-up, while there were no significant intragroup changes in food intake over time in either group. In this context, group B showed an increased intake of fresh fruit at baseline and at all significant follow-up periods.

For poultry (chicken), a significant difference was observed between the two groups after 24 months of loading ($A<B$; $p=0.031$). Thereby, a significant increase in the consumption of poultry ($p=0.003$) was observed in group A when comparing the baseline examination with the examination after 24 months after loading. For red and yellow vegetables (raw or cooked), a significant difference between the groups was recorded after 24 months ($A<B$; $p=0.032$). Here, the consumption habits in group B changed significantly over the course of the study ($p=0.002$), whereby the comparison between the baseline examination and the follow-up examination after 24 months was significant ($p=0.002$). The consumption of raw food 12 months after loading demonstrated a significant difference between the two groups ($A<B$; $p=0.042$). The time course within group A showed significant differences in comparison ($p=0.047$). Thereby, the consumption behaviour of raw food in group A increased significantly not only after 12 months ($p=0.016$), but after 24 months ($p=0.022$) as well. In addition, a significant increase in the consumption behaviour of raw food in group B was observed after 24 months ($p=0.009$). Although no differences in the consumption of leafy vegetables (raw or cooked) were observed between the groups, at least the time course in group B showed a significant change ($p=0.005$): In this case, the frequency of consumption showed a significant increase of consumption between the baseline examination and the examination after 24 months ($p=0.019$).

When the issue of **the avoidance of certain foods was investigated,** significant intergroup differences between the two groups at the time of baseline were only evident for apples with peel. Whereby more subjects avoided apples in group A ($n=30$; 63.8%), compared to group B ($n=14$; 31.1%). However, over the 60 months after loading, this difference between the two study groups became non-significant. Similar results are observed for the remaining 10 foods. Again, no significant differences were observed between the two groups at any study times during the first 60 months.

## CONCLUSION

The researchers found that any changes in the patients' dietary habits due to the insertion of a single midline implant in the mandible to support the existing complete denture was not observed, regardless of the loading protocol.

### Implications for practice

Improving the chewing efficiency by single midline implants in the edentulous mandible does not lead to a change in dietary habits.

## REFERENCE

1. Blender SM, Behrendt C, Fritzer E, Kappel S, Kohal RJ, Luthardt RG, Frfr. v. Maltzahn N, Reissmann DR, Wolfart S, Kern M, Passia N. Single mandibular implant study-impact on dietary habits after 5 years of observation in patients with immediate and delayed loading protocols. Clinical Oral Investigations. 2024 Oct 4;28(10):571

## 2. IS THERE AN ASSOCIATION BETWEEN SALIVARY IMMUNE AND MICROBIAL PROFILE WITH DENTAL HEALTH IN SYSTEMATICALLY HEALTHY CHILDREN?

Salivary diagnosis is a growing field, with identified markers associated with cancer, cardiovascular diseases, autoimmune diseases, viral and bacterial diseases, and human immunodeficiency.[1] One growing field in salivary diagnosis is its inflammatory profile as a potential marker for childhood illnesses, albeit with little attention to its profile in health and the impact of focal conditions, such as caries and gingivitis, on its composition.[1]

Caries and gingivitis are common oral microbial conditions in systemically healthy children. Thus, the local oral environment in such conditions potentially affects focal inflammatory and microbial salivary cytokines. In such cases, salivary inflammatory and microbial profiles may alter and should be considered when using saliva to examine health and disease.[1]

Several types of inflammatory biomarkers are associated with oral diseases in saliva.[1] Cytokines are among the most investigated biomarkers in this context due to their involvement in inflammatory, infectious and immunological diseases.[1] One salivary cytokine that has been studied in caries and gingivitis is interleukin-1 beta (IL-1β), indicating that it may be involved in the development of such conditions. Other studies have investigated the role of other salivary cytokines, such as tumour necrosis factor-alpha (TNFα) and interleukin-8 (IL-8), which are also involved in the immune response and contribute to the inflammatory process associated with caries and gingivitis.1 Evidence shows that such diseases can be detected in adults through saliva biomarkers, such as interleukins IL-1β, IL-6, IL-8, and IL-10, TNFα, and matrix metalloproteinases (MMP)-8 and IL-9.1

Davidovich and colleagues (2024)1 reported on a study that sought to characterise the inflammatory and microbiological profiles of the saliva of systemically healthy children and to

associate those levels with a clinical diagnosis of caries and gingival disease.

## Materials and methods

The study population comprised 100 children systemically healthy born during 2008-2016 (aged 4-12 years at the time of the study). Children with no previous relevant medical history and no medications on a regular basis. The inclusion criteria were systemically healthy children who did not take any medications and the children's and their guardians' agreement to participate in the research. The exclusion criteria were children undergoing orthodontic treatment and children who did not fast before the saliva collection appointment.

Dental examinations were conducted by one dental student using a dental mirror, a dental explorer and a dental probe. It included the following parameters:

- Oral hygiene – measured by the plaque index (PI) with a range of 0 (no plaque) to 3 (abundant plaque) and presented as an average for all sites, only on buccal surfaces. (0 – No plaque is in the area adjacent to the gingiva; 1 – There is a plaque in the form of a thin film on the gingival margin; 2 – There is a visible plaque in the gingival pocket and gingival margin; 3 – There is a dense plaque in the gingival pocket and on the gingival margin).
- Periodontal status – measured by the gingival index (GI) using a periodontal probe and with a range of 0 (no bleeding) to 3 (spontaneous bleeding) and presented as an average for all sites (0 – Healthy gums; 1 – Mild discolouration and oedematous gingiva. No bleeding on probing; 2 – Red, oedematous and shiny gingiva. There is bleeding on probing; 3 – Red, oedematous and ulcerated gingiva. There is spontaneous bleeding).
- Caries status – measured by the DMFT/dmft index (D=decay, M=missing, F=filling; T per tooth) in permanent/primary dentition and presented with a range of 0 (very low DMFT) to above 6.6 (very high DMFT) and presented as an average for all sites. All the values were collected and recorded in a data table.

Saliva was collected in a quiet room between 08:00 and 12:30h. The children refrained from eating, drinking, brushing their teeth or rinsing with mouthwash for at least 1h before spitting. Immediately after clinical examination, the children were asked to collect saliva in their mouths and spit it into a sterile wide test tube for 3min. The saliva was immediately stored at 4°C without any additives and further kept at -80°C until analysis. The data were collected on paper charts, which were transferred to a computer program.

Bacterial DNA was extracted from saliva using a DNA extraction kit. The DNA was then tested using specific primers for the total bacteria – *S. Mutans*, *Lactobacillus species* and *Fusobacterium nucleatum* – using SYBR-Green-based quantitative real-time PCR.

The Bradford Coomassie Assay (BCA) was used to quantify the total salivary protein levels according to the manufacturer's instructions. In brief, a standard curve was prepared using bovine serum albumin. All samples (standards and saliva samples) were then incubated with the BCA working reagent in a 96-well microplate at 37°C for 30min to allow colour development that was measured at a 562nm wavelength using a microplate reader.
The salivary levels of human TNFα, IL-10, IL-8 and IL-6 were measured using ELISA kits according to the manufacturer's instructions.

## Results

The study included 100 systemically healthy paediatric patients with a mean age of 8.08±0.23, 49% of whom were female. 28 children were between 4-6 years old, 62 were between 6-11 and 10 were between 11-13 years old. There was no statistical difference between males and females. The mean DMFT for the cohort was 2.64±0.31, the mean GI score was 0.51±0.06 and the mean PI score was 1.33±0.07.

The mean DMFT level was significantly lower in the permanent dentition age group than in the other dental age groups. The highest DMFT levels were observed for the primary dentition group (aged 6 years and younger), without statistical difference compared with the mixed dentition group. The mean GI level was statistically higher in the permanent dentition group than in the primary dentition group. The mean PI did not differ substantially between the groups ($p=0.14$).

GI and PI did not differ according to DMFT. Significant associations were found of PI above 1 with DMFT and GI. Significantly higher levels of PI were found among those with GI above 0 than among those with GI equal to zero.

The mean total protein level was higher, albeit without statistical significance, in the permanent dentition group than in the other dentition groups. For those with DMFT>2, GI above 0, and PI>1 groups, protein levels were modestly higher than in the comparative groups, although these comparisons were without statistical significance.

The levels of the inflammatory markers IL-10 and IL-6 showed a positive pattern according to age without any statistical differences. IL-8 and TNFα did not show age-dependent patterns. The mean levels of the inflammatory markers examined were higher among those with DMFT>2 than DMFT≤2; the difference was statistically significant only for the IL-8 level. IL-6 and TNFα were significantly higher among those with plaque>1 than plaque≤1. No statistically significant associations were observed between cytokine levels and GI.

*S. Mutan* was undetectable in the saliva of all cases. The total bacterial load was significantly higher for the mixed dentition group than for the permanent dentition group. The other stratifications did not show statistically significant differences in bacterial load.

## Conclusions

Researchers found that there was a higher level of IL-8 among those with DMFT>2 than DMFT≤2. There were higher levels of IL-6 and TNFα levels among those with plaque>1 than plaque≤1. The high presence of inflammatory cytokines may reflect dental caries status in children.

## Implications for practice

Salivary analysis has the potential to provide values information on caries, gingival and periodontal risk among children.

## REFERENCE

1. Davidovich E, Sarne H, Shmueli A, Polak D. Is there an association between salivary immune and microbial profile with dental health in systematically healthy children?. Clinical Oral Investigations. 2024 Oct 3;28(10):564