An issue of shortened dental arch to be considered from changes of soft tissues after unattended tooth loss

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- Part 1
What is biologic adaptation? Dr. Jiro Abe

• Introduction

Recently it is advocated in major European countries that no esthetic or functional problems are involved even if molar tooth loss is left unattended. And so cases of shortened dental arches (SDA) \(^1\) are increasing with restorations that are understood sufficient within arches of upper and lower second molars to second molars.

Interest in SDA is increasing in our country, too (Case 1) but cautious discussion is in process from academic meetings because some are concerned with potential adverse affects to patients’ QOL and oral function.

But researches so far on SDA are focused mainly on oral hard tissues such as teeth and TMJ, but they hardly refer to changes of oral soft tissues after unattended tooth loss.

So in this article, my personal opinion will be presented regarding how ill effects on future prosthetic treatment are associated with oral soft tissue changes accompanied with unattended dental arches typically representing SDA.

• Challenges to our readers

EBM (Evidence Based Medicine) is nowadays highly publicized. This is very important but issues raised throughout clinical practices cannot be entirely evidence based.

If you continue your practice by accepting an excuse as general atmosphere like, “You must not or cannot say anything without scientific data”, you cannot grow up yourself with professional mind like “thinking power about dental practice” or the power to observe subtle signs developing within the oral cavity against treatment and healthcare. In other words, it is the power of wisdom of our predecessors teaching, “If you have no attitudes of solving clinical problem by yourself, you cannot be elevated of treatments skills.”

The author thinks what you are agreeable in confidence of “definitely yes” with comments and reports stated by thoughtful clinicians should be dealt with clinically based evidence. It is difficult to draw conclusion from one single data, as phenomena of the oral cavity are complex web of factors.
What is biologic adaptation after unattended tooth loss?

As a dentist when we see any tooth loss in the mouth, we cannot help thinking how to restore the missing gap. But we must stop to think how the mouth will change if the gap is left unattended. First let us think about the lower second molar tooth as an example. When one tooth of the second molar is lost, any dentist will not try to fill the gap. Such a patient, who complains of tooth loss and of food bolus deposit at the tooth loss, will not complain any more with no food deposit or no problem soon within a month or so. (Fig.1)

There should be the missing space immediately after the tooth loss, but why does a patient feel no more inconvenience? Careful observation reveals the gap already filled with the tongue side wall and buccal mucosa in about a month. ((Fig.2)

The purpose of prosthetics for a defective gap is, “To restore lost tissue and function”, but in this case, lost tissue is filled with movable mucosa of human body without making any necessary prosthetics. So it may be reasonable to think that oral functions might have been maintained with this filling.

From this viewpoint about posterior tooth loss case, we are going to realize that living body will compensate lost tissues and restore functions in a wide variety of ways.

In these ways we humans have a capacity to attempt to close a gap in a rapid manner if any lost space is left unattended. This source of capacity is thought to be derived from the negative pressure in the mouth in accordance with human swallowing that comes to 2,000 times per day.

There is an individual difference but, when we swallow saliva or food bolus with the mouth closed, its negative pressure is fairly strong enough, and its strength pulls the soft oral tissues into the lost space, and consequently the missing gap will be infilled fully with movable tissues like buccal mucosa and sublingual mucosa. The author terms this condition as “Biologic adaptation”.

This concept of biologic adaptation would respond easily to questions of various unaccountable events often seen in clinical scenes. Following items (1) ~ (4) will be presented by demonstrating examples that were handled before without prior knowledge of biologic adaptation.

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**Fig.1** Immediately after lower second molar tooth extraction, patient who complains of inconvenience will not complain soon in a month.

**Fig.2** Biologic adaptation in lower left second molar tooth loss. After missing, ridge resorbed fast, and buccal mucosa and tongue side wall fill the space.
What is biologic adaptation after unattended tooth loss?

(1) Missing teeth of lower first and second molars on both sides were left unattended at the initial visit. A young dentist made a partial denture and tried to insert it, but the patient refused it because he said, “It is bulky in the mouth and I cannot help it.” (Fig.3)

Fig.3  Missing case of both sides lower first and second molars. What is called, ‘doubled tongue’ or ‘multiple tongues’.

It shows that long-term unattendance bloated the sublingual mucosa to fill in the gap. It looks as if another tongue were added on the natural tongue. That is so called ‘doubled tongue’ or ‘multiple tongues’. It might be said like prosthesis being filled with the sublingual mucosa. In other words, living body replaces as a final restoration. And even if any partial denture is tried by forcing and pushing away the sublingual mucosa or buccal mucosa, insertion is impossible as the gap is already filled fully. Clearly a patient may be annoyed and may not accept it.

(2) At a patient’s initial visit, after upper second molars on both sides were left unattended for 10 years, an implantation was advised. But the patient refused it, saying, “I am not in need” and did not accept planned stage of treatment. (Fig.4)

Fig.4a ~ 4e  Observation of buccal mucosa at right upper second molar tooth loss. Buccal mucosa is bloated accordingly from larger opening of the mouth toward smaller closing to fill the gap.

By watching carefully around this patient’s mouth opening to closing, the missing space is bloated with buccal mucosa to fill the gap. In fact restoration seems already completed with living body. Namely any artificial restoration material is not in need as a matter of course.

In both cases above, it is known that a dentist is skillful to watch in the mouth if it is opened, but if it is closed, there is no trial of diagnosing within the mouth for such a dentist. It is a professional event of no excuse responsible for lacking diagnostic skill and strength.
What is biologic adaptation after unattended tooth loss?

How do we determine presence of adaptation?

In order to determine whether biological adaptation is already accomplished or not, dentist’s diagnostic interview gives us important clues as follows. (Fig.5)

- How many years passed since the gap unattended?
- Is there any food deposited in the gap?
- Is there any difficulty of eating?

These three questions determine whether the missing gap is already infilled with living body buccal mucosa and sublingual mucosa.

Because there is already adapted biologically, it may be difficult if we try to insert artificial restoration of our construction into the missing gap.

On the contrary, if we judge the necessity of restoration by any means, we should be better to start with a minimally small prosthesis, and if possible, to enlarge the base gradually by watching patient’s response carefully. And it might be appropriate to propose several options to patient such as denture acceptance or not, and if not, autogenous tooth transplant, artificial implant and so on. (Case 2, 3) Without this process, just insisting on an expensive practice would cause a dangerous trouble with patient at any time.

CASE 2 (photo 2-1 ~ 2-4) Case where autogenous tooth transplant is applied.

2-1 Preoperative oral cavity. Ridge resorption after unattended tooth loss. Partial dentures were twice tried but were not accepted, and autogenous tooth transplant was performed.

2-2 Preoperative panoramic radiograph. Tooth transplant from right lower premolar to right lower molar. From left first premolar to left first molar.

2-3 Postoperative panoramic radiograph.

2-4 Postoperative bridgeworks. Right lower first and second premolars and first molar. Left lower canine, first and second premolars and first molar. In 10 years postoperative. Prognosis is good.
What is biologic adaptation after unattended tooth loss?

**CASE 3 (photo 3-1 ~ 3-10) Case coped with implants**

3-1 Preoperative panoramic radiograph at the initial visit. Bone resorption is found at lower right alveolar bone at unattended tool loss.

3-2 Facial view after insertion of training partial denture.

3-3 Same occlusal view. Finally partial denture was not accepted, but before entering expensive treatment, this stage is important. Patient complained of the denture bulky with and cannot wear being pushed with tongue and buccal mucosa.

3-4 Free gingival graft is placed in the tooth loss area for later implant placement.

3-5 Panoramic radiograph after implant placement.

3-6 Right lateral view of implant superstructure.

3-7 Same at mandibular occlusal view. Implant connection with natural tooth was made with a key and keyway.

3-8 Same of dental radiograph.
What is biologic adaptation after unattended tooth loss?

- Case difficult to explain in the past so far.

(3) Maxillary tooth extrusion together with alveolar bone. If periodontic disease is present, normally only teeth were elongated from living body trying to eliminate inflammation. (Case 4, 5)

Case 4-1 Upper teeth extrude with alveolar bone. (number indicate pocket depth)

Case 5-1 Normally, posterior teeth involved with periodontal disease without opposing teeth will be elongated, and only tooth is elongated. Rarely joined alveolar bone.

(4) Maxillary tuberosity downgrowth to mandibular missing space. Surgical elimination of the tuberosity was originally planned to receive restoration in the mandibular space, but patient refused it, saying “I am not in trouble”. (Case 6)

Case 6-1 Maxillary tuberosity is flattened bucco-lingually in downgrowth as if it fills in the missing space.

These examples both in (3) and (4) are often heard in practice, but, in the past so far, no definite answers were made as to why teeth were elongated going together with alveolar bone, and why maxillary tuberosity downgrowth was developed toward mandibular posterior gap.

The author now understands that any space created inconvenience to living body in the oral cavity is attempted to be filled with not only soft tissues but also hard tissues jointly. Namely they move and change together accordingly.

The patient tongue habit to hold tongue with upper and lower anterior teeth for swallowing will not only move teeth positions to develop an open bite but also will change facial bone structure.

Daily negative pressure strength will sometimes move teeth toward the missing gap and will flatten the maxillary tuberosity buccolingually in downgrowth development working together with both buccal and tongue pressures in order to fill the gap finally and to accommodate a series of fluent feeding activity from mastication through swallowing. No wonder that eating would be inconvenient if any hollowed space continues to exist in the oral cavity.

On a first glance, it looks advantageous to go without any restoration with the help of movable tissues filling in the unattended missing space unattended.
But it is true that this adaptation will raise another new problem. What goes definitely together with this adaptation is significant alveolar ridge resorption. Almost all the ridge mucosa (masticatory mucosa) of missing region will be lost extensively leaving only alveolar mucosa (lining mucosa). In other words, the ridge will become a case of difficulty for prosthetic treatment, resulting in the worst disadvantage of a thread-like residual ridge. Now let us look again at the photo of SDA. (Fig.6-2) Bone loss condition of the missing area in SDA case exhibits an extraordinary bone resorption that cannot receive a restoration of any kind in later years.

Fig.6 Results after unattended missing space for a long-term period in SDA. Ridge resorbs significantly, and making later prosthetic treatment difficult.

In next issue, mechanism of biologic adaptation and difference of maxillo-mandibular jaw ridge bone resorption will be presented. (reference will be listed together in next issue.)