Efficacy and Clinical Utilization of UV Activated Implant

V. Utilization of UV Implant at the time of navigation implant surgery

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Improved property changes of implant surface due to UV Activation have the following effects:1. Removal of organic matters such as hydrocarbon, etc. from the implant surface,2. Convert hydrophobic surface into super-hydrophilic surface, and3. Induce quicker synostosis and osteointegration as well as high Bone to Implant Contact (BIC) not only through increased adsorption of protein by inducing the changes in the surface charge from negative to positive but also formation of cell-friendly interface through attachment, proliferation and differentiation of osteoblast cells.Therefore, UV Activation implant is being highlighted as a solution for difficult and arduous case that had to be approached limitedly. Moreover, its assertive utilization in Immediate Restoration cases using Digital Guided Surgery is also required.

I believe Digital Guided Surgery (navigation surgery) is one of the hottest issues in the dental clinic field. Digital Guided Surgery (navigation surgery) is being presented and accepted as a solution for more extensive utilization and expansion of treatment domains among the clinicians in my surroundings. Surgical guide procedure, which had been presented as a solution for cases with loss of numerous teeth for which setting of reference point for embedding of implant is difficult, in the past failed to win the preferences among the clinicians due to low level of accuracy than anticipated level, prolonged delivery time, cost burden and limited application to specific cases. However, through the resolution of such restrictions by means of marked advancement of digital imaging technologies (equipment) over the last several years, it is achieving expansion of treatment into new domains.

[Efficacy of Digital Guided surgery in clinical settings]

① Predictability

Precision diagnosis is possible and the results of actual surgery can be predicted through 3D mock surgery on the basis of the data acquired through digital imaging devices such as CBCT and oral scanner. Accordingly, it is possible to increase the success rate of implant surgery through considerations for the anatomical structure by means of digital data rather than simply relying on past experiences, and it can become the motive force in better harmonizing communication with the patients (Fig. 1).

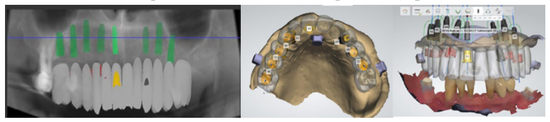


Fig. 1: Data (CT Data & Intraoral Scan Data) and mock surgery through digital imaging devices

In addition, it is possible to produce temporary prosthesis in advance through mock procedure, and to markedly improve even the aesthetic aspects by setting the prosthesis immediately after embedding the implant.

② Reduce prosthesis stress (Top-Down format)

The most latest mock surgery software for execution of Digital Guided Surgery, as illustrated in the diagram (Fig.2), sets the position and size of the prosthesis for the lost tooth first, and then sets the position, depth and angle, etc. of the implant, thereby resolving stresses arising from the production and attachment of prosthesis. If Digital Guided Surgery is not utilized, there occasionally are cases accompanied by concerns for the production, attachment and long-term use of implant prosthesis due to the unintended implant embedding results.

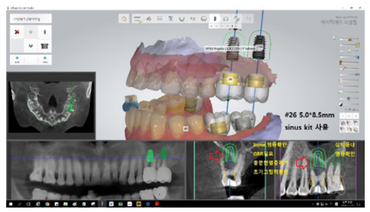


Fig.2 Can set the position of the implant after having set the prosthesis by using the Planning Software

③ Shortening of surgery time

Although it takes about a week to produce separate guide in addition to the time taken for the diagnosis for implant surgery, patient can accommodate it without difficulty by providing sufficient explanations and guidance to the patient. It is possible to shorten the time needed for the implant surgery by omitting the suture process that requires substantial amount of time in ordinary implant cases to certain extent.

④ Increase the level of satisfaction of the patient

Most importantly, since the level of satisfaction of the patient is very high with high level of consent rate for the surgery, there is no reason for surgeon to reject it either. Generally, procedure is conducted with minimum incision, thereby resulting in little bleeding and swelling as well as quick recovery speed of the patient, thereby resulting in very high level of satisfaction by the patients.

[Flapless Surgery]

There have been a lot of conflicting opinions on the Flap Surgery and Flapless Surgery. I feel it is meaningless to make determination of whether which is right or wrong since they are all based on the facts confirmed through experiments of the researchers and experiences of the clinicians. In fact, I do not prefer Flapless Surgery and prefer to embed implant after having personally confirmed the status of the bones in most of the cases. However, since the Digital Guided Surgery is generally executed in Flapless Surgery format, it is deemed that the advantages of Flapless Surgery can be applied to clinical setting quite usefully.

① Prevention of bone absorption

Various experiments and researches reported that Flapless Surgery can prevent natural bone absorption. According to Wilderman N. et al., it is reported that prescribed quantity (average of 0.5mm) of marginal bone is absorbed after the full thickness flap surgery in the event of opening the flap and, if the flap is not opened in the case of flapless surgery, there was no occurrence of bone absorption (Fig.3).

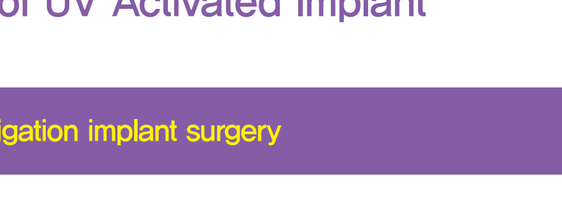


Fig3. Absorption of marginal bone after Flap Surgery (left) and Flapless Surgery (right) (animal experiment: Professors Choi, Byeong-Ho and Jeong, Seung-Mi of Severance Hospital in Wonju)

② Prevention of inflammation around the implant

As the results of histologically and clinically Activated the surrounding issues healed after the implant surgery, it is predicted that there would be high resistance against inflammation around the implant after healing in the flapless surgery conducted without opening the flap since there is no formation of deep pocket during the surgery (Fig. 4: Professors Choi, Byeong-Ho and Jeong, Seung-Mi of Severance Hospital in Wonju).

It is possible to execute predictable embedding of the implant and increase the implant success rate when quick synostosis is accompanied in Immediated Restoration case through in Digital Guided Surgery (navigation surgery). Therefore, assertive use of UV Activated implant is required since it is also possible to save time if the implant needed in accordance with the surgery time by Activating implant with UV light in advance since the diameter and length, etc. of the implant to be embedded have been decided through analysis prior to surgery in Digital Guided Surgery case.

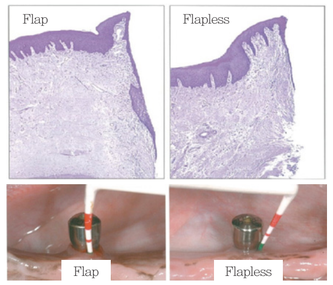


Fig.4 Findings of soft tissue healed after flapless surgery (right) and the depth of probe

[Case]

This 59-year old patient visited the hospital with the main request to extract all the teeth with poor conditions due to existing illness and to undergo implant treatment The patient was suffering from diabetes and has been taking oral bisphosphonate drug for osteoporosis for more than 4 years after having been diagnosed with osteoporosis. Following consultation with the orthopedic specialist, fixation prosthesis treatment was conducted by using implant after 3 months of rest period. Re-administration of drug was carried out after the bone has been healed completely. Multiple numbers of residual dental roots and hopeless teeth were observed under X-ray at the time of initial clinical examination. Among these, #31, 32, 41, 42 and 43 were retained with the extraction of the other residual dental roots and teeth in poor conditions before planning embedding of several implants in the maxillomandibular area (Fig.5).

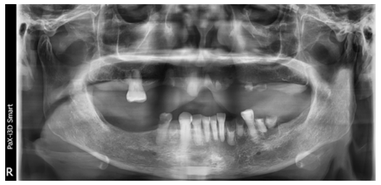
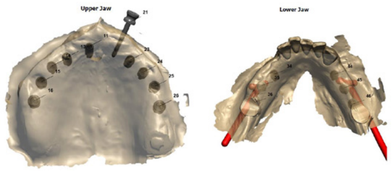


Fig.5 Panoramic view at the initial examination

Several implants were embedded in the upper jaw by accompanying maxillary sinus augmentation on both sides (Fig. 6). Surgery was conducted by confirming the position of embedding and deciding the implant type by executing Digital Guided Surgery analysis (Fig. 7).

Fig.6 Both sinus B.G and panoramic view after 1st embedding in maxillomandibular area



Implant information			
Implant position (FDI)	11	13	14
Manufacturer	DIO	DIO	DIO
Type	UF(II)N 3310S	UF(II) 3810	UF(II) 4010
Order number	UF(II)N 3310S	UF(II) 3810	UF(II) 4010
Length, mm	10	10	10
Diameter (Ø), mm	3.3	3.8	4
Color	Yellow	Blue	Red

Implant information			
Implant position (FDI)	15	16	21
Manufacturer	DIO	DIO	DIO
Type	UF(II) 4508	UF(II) 5008	Upper Anchor Pin
Order number	UF(II) 4508	UF(II) 5008	screw 15mm (Upper)
Length, mm	8.5	8.5	15
Diameter (Ø), mm	4.5	5	2
Color	Gray	Green	N/A

Implant information			
Implant position (FDI)	23	24	25
Manufacturer	DIO	DIO	DIO
Type	UF(II) 3810	UF(II) 4010	UF(II) 4508
Order number	UF(II) 3810	UF(II) 4010	UF(II) 4508
Length, mm	10	10	8.5
Diameter (Ø), mm	3.8	4	4.5
Color	Blue	Red	Gray

Implant information	
Implant position (FDI)	26
Manufacturer	DIO
Type	UF(II) 5008
Order number	UF(II) 5008
Length, mm	8.5
Diameter (Ø), mm	5
Color	Green

Implant information			
Implant position (FDI)	34	35	36
Manufacturer	DIO	DIO	DIO
Type	UF(II) 4010	UF(II) 4510	UF(II) 5008
Order number	UF(II) 4010	UF(II) 4510	UF(II) 5008
Length, mm	10	10	8.5
Diameter (Ø), mm	4	4.5	5
Color	Red	Gray	Green

Implant information			
Implant position (FDI)	44	45	46
Manufacturer	DIO	DIO	DIO
Type	UF(II) 4010	UF(II) 4508	UF(II) 5007
Order number	UF(II) 4010	UF(II) 4508	UF(II) 5007
Length, mm	10	8.5	7
Diameter (Ø), mm	4	4.5	5
Color	Red	Gray	Green

Fig.7 Digital Guide analysis data

Bone graft was executed while embedding implant immediately after extraction of several teeth. Procedures were conducted in flapless Digital Guided Surgery format as much as possible and DIO-UV implant was used after having Activated with UV light (for 15 minutes) 20 minutes prior to the surgery (Fig.9-1~2).

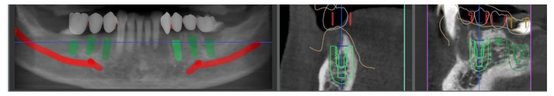


Fig.8 Digital Guide analysis data

Maxillomandibular prosthesis was completed on the 12th week after the surgery due to absence of any particular complication (Fig. 10-1~2). Final prosthesis was set substantially earlier than the ordinary SLA surface treated implant.

Fig.9-1 UV Activator

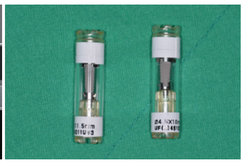


Fig.9-2 UV Implant

Even the SLA surface, which had been recognized as the most stable and proven implant surface processing format until recently, has limitations. It seems that the clinicians are accepting it as the original function of SLA surface processing rather than limitations of SLA surface. Conclusion is that SLA surface processing can induce substantially more biocompatible and quicker synostosis and osteointegration than what can be experienced in clinical settings. However, the functions are degraded due to the attachment of organic matters such as hydrocarbon, etc. onto the implant surface that interfere with synostosis and osteointegration with passage of time after the processing of titanium (some products are distributed by being immersed in solution to prevent contact between the implant surface and air after the processing of titanium). Therefore, it is possible to induce the outstanding biocompatible properties of the SLA surface processing by removing organic matters attached to the implant surface immediately prior to the implant procedure. Means of such removal is UV Activation with photo-catalysis effect. Through UV Activation, it would be possible to optimize the original functions of SLA treated surface including shortening of synostosis healing time, strengthen resistance against inflammation around the implant and improvement of implant success rates in difficult cases with inadequate initial bone contact area between the aged bone and implant, etc. that can currently be achieved.

Fig.10-1 Panoramic view of the stages of progress in prosthesis

Fig.10-2 Panoramic view after the final prosthesis