

Osteosynthesis Using the Uncalcined and Unsintered Hydroxyapatite / Poly-L-Lactic Acid System

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Abstract

The poly-L-lactic acid mini-plate system accomplished rapid development. However, the system still has a variety of problems. One such problem is the breakage of screws. In this technical report, we develop the temporary fixing screws made from stainless with hexagon steel that exhibit a hexagonal head and thread part that also features a tapping function.

Keywords: PLLA mini-plate system, reconstruction surgery, temporary fixing screws

INTRODUCTION

The poly-L-lactic acid (PLLA) mini-plate system is one of the various bioabsorbable materials that are used during plastic and reconstruction, orthopedic, craniofacial, and oral, and maxillofacial surgeries. This is because the system was rapidly developed and deployed. Despite its widespread use, the breakage of mini-screw heads regularly occurs during screw removal. Therefore, we developed temporary fixing screws made from stainless steel that exhibit a hexagonal head and thread and features a tapping function because uncalcined and unsintered hydroxyapatite (u-HA)/PLLA screw is very expensive.

TECHNICAL NOTE

The application of the temporary fixing screws in clinical practice is described for a hypothetical plate with four holes. First, holes are made using a drill, and the temporary fixing screws are placed into the two medial holes [Figure 1]. Second, u-HA/PLLA screws are placed into the two external holes that were created using the thread portion of the tapping driver. Finally, the temporary fixing screws are replaced by the u-HA/PLLA screws without tapping [Figures 2 and 3].

DISCUSSION

In the past, several researchers have reported the utility of the PLLA plate system (Fixsorb™-MX; Takiron, Osaka, Japan) as

well as of the conventional titanium mini-plate system. Recently, a new bioabsorbable mini plate system has been developed, which is made of forged composite material containing u-HA particles and PLLA (u-HA/PLLA system: Super Fixsorb™ MX; Takiron, Osaka, Japan).^[1-3] This u-HA/PLLA system is stiff, completely bioabsorbable, and osteologically bioactive. Moreover, it exhibits a stronger fixation power than the PLLA system. Therefore, the thickness of the plate was changed from 1.5 mm to 1.0 mm, thereby reducing the sensation of the presence of a foreign object in the patient's body. As a result, we aggressively use the u-HA/PLLA system for orthognathic surgery, particularly for Le Fort 1 osteotomies, since there is no need for a second operation to remove the implant.

Nevertheless, the u-HA/PLLA system is complicated by the susceptibility of the screw heads to breaking if a sufficiently strong force is applied. Therefore, an exclusive driver system that contains a clutch with limited torque is needed, which can prevent the breakage of screw heads since the clutch detaches when the screw is fully inserted. However, the breakage of the mini-screw head still can occur when these screws are

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Figure 1: First step: The temporary fixing screws are used to construct two medial holes



Figure 2: Second step: The temporary fixing screw is removed



Figure 3: Final step: The temporary fixing screws are replaced by the Super-Fixorb MX® screws without tapping

removed, possibly because the removal system does not have a clutch function when inverse rotation is applied. The u-HA/PLLA plates are placed in the lateral border of the piriform aperture and bilaterally in the lower ridge of the zygomatic bone during Le Fort I osteotomy. At that time, the u-HA/PLLA screw often has to be removed because the bone of the lateral border of the piriform aperture is often thin.

Therefore, we developed the temporary fixation screw system to address this problem. In general, the u-HA/PLLA screw is placed after tapping. Therefore, we developed a temporary fixing screw made from stainless steel with a hexagonal head and thread part that features a tapping function. When using this method, it is not necessary to remove the u-HA/PLLA screws.

Moreover, our system is sufficiently simple to operate. Finally, use of the temporary fixative screws will be done with greater confidence as the use of the system increases.

CONCLUSION

We believe that this temporary fixing screw system is remarkably valuable and economical.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Shikinami Y, Okuno M. Bioresorbable devices made of forged composites of hydroxyapatite (HA) particles and poly-L-lactide (PLLA): Part I. Basic characteristics. *Biomaterials* 1999;20:859-77.
2. Shikinami Y, Okuno M. Bioresorbable devices made of forged composites of hydroxyapatite (HA) particles and poly L-lactide (PLLA). Part II: Practical properties of miniscrews and miniplates. *Biomaterials* 2001;22:3197-211.
3. Shikinami Y, Matsusue Y, Nakamura T. The complete process of bioresorption and bone replacement using devices made of forged composites of raw hydroxyapatite particles/poly l-lactide (F-u-HA/PLLA). *Biomaterials* 2005;26:5542-51.