Bone flap malunion and resorption after cranioplasty with bioabsorbable implants in an adult drug abuser

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Abstract

Bioabsorbable plates and screws have been widely used in pediatric craniofacial reconstruction. However the indications in adult patients are still controversial. We reported a 22-year-old male drug abuser who received post-traumatic cranioplasty with an auto bone graft and bioabsorbable fixation system. The auto bone graft finally revealed non-union and resorption. In our patient who have a history of drug abuse may be relatively contraindicated for the application of bioabsorbable fixation systems.

Key Words: Bone flap resorption, bioabsorbable implants, drug abuser

Introduction

It is well known that bioabsorbable implants have been widely used in pediatric craniofacial reconstruction in the past two decades. These materials can provide adequate strength and stability without complications of the metal fixation systems. However, there are still complications with the bioabsorbable systems. Herein, we reported the case of a young adult patient with a history of drug abuse that experienced bone flap non-union and resorption after cranioplasty with bioabsorbable plates and screws.

Case

A 22-year-old male college student sustained traumatic brain injury in July 2011. A decompressive craniectomy at the right Fronto-Tempo-Parietal area was carried out. After his condition had stabilized, he underwent cranioplasty with bioabsorbable implants in Aug. 2011. However, he complained the bone graft was floating a few months after reconstruction. Brain CT revealed malunion and resorption of his auto bone graft (Fig. 1A and 1B). After discussion with him and his family, we performed another cranioplasty in Jan 2013. During the operation, we noted the non-union of the auto bone graft without plate or screw fixation. Also, the bone graft had been reabsorbed. We removed the previous bone graft and reconstructed the bone defect with bone cement (Fig. 2). After operation the patient recovered well, and was discharged. Tracing the previous history, patient admitted the history of drug abuse.

Discussion

Bioabsorbable plates and screws, which

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have been clinically available since 1996, are composed of various combinations of polylactic acid and polyglycolic acid polymers (family of polyorthoesters). These implants are widely used in young pediatric patients.\(^1\) Compared to metal implants, bioabsorbable fixation systems can provide stable fixation in cranial surgery while avoiding the problems with metal fixation systems, such as imaging artifacts, erosion into the dura and brain parenchyma, and restriction of bone growth.\(^1,3\)

The complications of bioabsorbable fixation systems include inadequate resorption, osteolysis, inflammatory foreign body reaction, plate extrusion, and infection.\(^1,3,8,10,11\) Barry et al. reported their clinical experience with resorbable plate and screw fixation in 1,883 pediatric craniofacial surgeries.\(^1\) In this series, the incidence rates of significant complications were all below one percent, and the overall reoperation rate attributable to identifiable device-related problems was 0.3 percent. According to current research, bioresorbable materials are thought to be beneficial in pediatric craniofacial reconstruction.\(^9\)

The use of bioresorbable fixation systems has been expanded to adult craniofacial reconstruction, but the role of bioabsorbable plates and screws is still controversial. Serlo et al. reported a 36-year-old male that underwent cranioplasty with bioabsorbable plates and screws.\(^12\) No post-op complication was noted at the one-year follow-up. However, Kwon et al. reported five patients with cellulitis as a complication in a series of 430 adult patients with facial bone fracture that received reconstruction with bioabsorbable systems.\(^13\) Five patients had an implant-related delayed inflammatory reaction and infection. This series reminds us that when using bioabsorbable fixation systems with adult patients, compared to pediatric patients, some different factors should be considered.

Our case is the first report of a young adult patient with the complication of aseptic bone resorption after cranioplasty with bioresorbable plate and screw. Our patient was a drug abuser with an mixed drug abuse history. Cocaine and amphetamine may induce oral or nasal area necrosis due to inhalation of the drugs.\(^14-16\) Furthermore, these drugs may contribute to systemic destruction, such as calcaneus osteonecrosis, onlay bone graft failure, or skull base erosion.\(^17-19\) These phenomena are thought to be related to a neuropeptide: cocaine and amphetamine-regulated transcript (CART). This peptide is expressed in the brain, pituitary gland, hypothalamus and pancreatic islets. The messenger ribonucleic acid

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**Fig. 1.** Brain CT with 3D reconstruction.

**Fig. 2.** We removed the previous bone graft and reconstructed the bone defect with plates and screws mixed with bone cement.
(mRNA) of CART was found to be up-regulated in the striatum after acute cocaine or amphetamine injection in rats. This peptide is believed to participate in many physiological functions, including bone remodeling.\textsuperscript{20-22} This may give us a hint that bioabsorbable materials may not be indicated in patients that are drug addicts.

**Conclusion**

Although bioabsorbable fixation systems have been widely used in pediatric patients for cranial reconstruction, the indications for the use of bioabsorbable implants in adult patients are still unclear. Also, adult patients have some risk factors that differ from those of pediatric patients. In our opinion, bioabsorbable materials may not be suitable for use in drug abusers because abnormal bone remodeling may be present. More studies are needed to clarify the indications and contraindications of the use of bioabsorbable fixation systems in adult patients.

**References**

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生物可吸收骨材應用於經顱骨成型術之成年毒品者後引起骨瓣癒合不良及吸收

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摘要

生物可吸收骨釘骨板已廣泛的使用在小兒顱骨顏面重建手術中，然而使用在成人仍然未知。我們報告一例 22 歲男性服用毒品之病患因外傷後使用生物可吸收骨釘骨板於顱骨成型術中，最後此骨瓣沒有融合且被吸收掉，所以我們認為使用毒品的成人應是生物可吸收骨材之相對禁忌症。

關鍵詞：顱骨顏面重建，生物可吸收骨釘骨板，服用毒品