

## Clinical Notes

# Outcome Analysis for Correction of Single Suture Craniosynostosis Using Resorbable Fixation

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A retrospective review was performed on 63 patients at Childrens Healthcare of Atlanta at Scottish Rite who underwent correction of single-suture craniosynostosis using a resorbable fixation system. Included in the series were 24 patients with metopic synostosis, 15 with sagittal synostosis, and 24 with unicoronal synostosis. The average age at operation was 22.7 months (range: 2.8 months–18 years), and mean follow-up time was 30.7 months (range: 7.1–10 years). Reoperation equal to or exceeding the magnitude of the original procedure occurred in 4.76% of the patients. This was comparable to the reoperation rate observed at our institution using traditional fixation systems. Minor complications related to the use of resorbable plates were also identified, and the final outcome for single-suture synostosis was favorable. Results suggest that resorbable plates and screws are as effective as titanium-based systems in the treatment of single-suture synostosis.

**Key Words:** Craniosynostosis, single suture, resorbable fixation, titanium

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**E**ffective management of craniosynostosis involves extensive cranial remodeling within the first year of life.<sup>1</sup> Microplating systems have become an integral part of pediatric craniofacial reconstruction, given their ability to provide structural integrity and support. Titanium plating systems have traditionally been used for rigid fixation because they are easy to apply, effective, and generally well tolerated. However, concerns about growth restriction, transcranial migration of the hardware, and the occasional infection or plate exposure have led to the search for alternative methods of fixation.<sup>2-4</sup>

Technical advances in plating systems have stimulated an evolutionary interest in the use of resorbable polymer plates and screws for craniofacial surgery. Since its introduction, rigid fixation using resorbable polymers has been used by many surgeons.<sup>2-6</sup> The ability of these plates to maintain sufficient rigidity until skeletal healing is complete has made them an attractive alternative for pediatric skeletal fixation. The ideal resorbable fixation system should not interfere with healing, should provide adequate stability throughout the process of bone healing, and should not cause any local or systemic side effects. During the past 2 decades it has become apparent in the literature that surgeons have been using this system with encouraging early results.<sup>5-8</sup>

Most of the initial applications were used in areas of minimal weight bearing; however, several reviews have discussed the use of resorbable fixation devices in areas of higher stress, as in facial fractures and mandibular advancements.<sup>9-11</sup> Likewise, we have used a resorbable plating system (Lactosorb,

Lorenz Surgical Inc.) for the correction of single-suture synostosis. Specifically, these resorbable plates and screws have been used to stabilize advancements of the frontal bone and/or the orbital bar.

This report reviews our experience with the use of Lactosorb plates and screws for the reconstruction of single suture craniosynostosis. Comparisons were made to historic controls from a series previously reported at this institution.<sup>12</sup> The evaluation of results and outcome analysis focused on indications, reoperation rate, and complications. Additionally, cost analysis was completed for both systems.

**PATIENTS AND METHODS**

All patients who underwent correction of single-suture synostosis between September 1996 and March 2000 were identified. They were seen by a multidisciplinary group at the Center for Craniofacial Surgery at Children’s Hospital of Atlanta Scottish Rite, and underwent corrective surgery by a team of craniofacial surgeons and neurosurgeons. A retrospective review of 63 consecutive patients who underwent correction of their deformity with Lactosorb plates and screws was compiled. Our protocols for managing these patients are shown in Table 1. The Lactosorb resorbable craniomaxillofacial fixation system (Walter Lorenz Co., Jacksonville, FL) was used. This system is made of a patented copolymer of poly-L-lactic acid and polyglycolic acid. Data points were queried with regard to patient demographics, indications, operative intervention, and postoperative course. Outcome measures included postoperative complications, reoperation rate, recurrence, and outpatient follow-up. Reoperation was defined as total if it equaled or exceeded the magnitude of the original procedure, or partial if it did not. Partial reoperations included minor recontouring with or without hardware removal. Patients were followed either directly through clinic visits or indirectly through personal communication. Complications were recorded and noted as either unrelated to aesthetic outcome, or those requiring reoperation. A cost analysis was also performed per hospitalization for the Lactosorb patients. A formal statistical analy-

sis was not performed, given the size of each group in our series.

**RESULTS**

**Demographics**

Sixty-three patients underwent correction of a single-suture synostosis using the Lactosorb system, and were included in the series. There were 46 males (73%) and 17 females (27%), and the mean age at the time of operation was 22.7 months (range, 2.8 months–18 years). The diagnosis in the patient population included 24 patients with metopic synostosis (38%), 15 patients with sagittal synostosis (34%), and 24 with unicoronal synostosis (38%). Average length of stay was 3.2 days (range, 2–6 days) All patients in this series required a bifrontal craniotomy with cranial vault remodeling via a coronal incision (Figs 1 and 2). Early sagittal synostosis requiring strip craniectomies were not included in this review. All plates and screws were from the Lactosorb (Lorenz/Biomet, Warsaw, IL) 1.5-mm set. The average number of mesh panels used per patient was 1.5, with an average of 13 screws per patient. Mean follow-up time was 30.7 months (range, 7.1 months–10 years).

**Complications**

Six patients (9%) had no postoperative data and were lost to follow-up. Nine patients (14%) experienced general complications while in the hospital, unrelated to the Lactosorb plating system. The complications included intraoperative blood loss, airway difficulties, chemosis, dural compromise, and Jackson-Pratt (JP) drain malfunctions. Palpable hardware was noted in the early postoperative period in seven patients (four metopic, two sagittal, one coronal), and one patient with metopic synostosis had an area of redness in the area of the plate, which resolved with antibiotic therapy. Patients with palpable hardware were also managed conservatively, and had complete resolution by 6 to 9 months postoperatively. Three patients with metopic synostosis and one patient with sagittal synostosis did require a partial reoperation with minor recontouring for bony irregularities, and had their hardware removed at the same time. These patients were not included in the total reoperative group.

**Total Reoperation Rate**

Three patients (4.76%) required a total secondary reconstruction (Table 2). The indications for reoperation and procedures performed can be found in

**Table 1.** Treatment Protocol for Isolated Synostosis

<i>Isolated Synostosis</i>	<i>Treatment</i>
Sagittal synostosis (>7 weeks, severe deformity)	Total cranial vault reconstruction at presentation
Unicoronal and metopic synostosis	Fronto-orbital remodeling, floating forehead at 4 to 6 months of age

