Optimizing Reconstruction in Craniosynostosis: A 12-Year Review of 162 Non-Syndromic Patients

Presenter: Hayeem Rudy, BA

Co-Authors: Sean B. Herman, MD; Carrie S. Stern, MD; David A. Staffenberg, MD; James T. Goodrich, MD, PhD; Oren Tepper, MD

Affiliation: Albert Einstein College of Medicine, Bronx, NY

Treated with a Novel Technique

PURPOSE: Open cranial vault remodeling (CVR) with autologous split calvarial bone grafts redistributes and recontours an abnormal calvarium to create an expanded cranial vault in patients with craniosynostosis. We report a 12-year retrospective review of 162 non-syndromic patients who underwent operative repair using our previously-described technique which portends excellent surgical outcomes, maximizes operative efficiency, and decreases total blood loss with low revision and complication rates.

METHODS: Data was gathered on patients who underwent cranial vault remodeling from 2005 to 2016. Surgical records for each patient were analyzed and included operative time, estimated blood loss, and intraoperative transfusion volumes. Intraoperative and post-operative complications, the need for revision surgery, post-operative length of stay and follow-up records were also reviewed. Syndromic patients were excluded, as well as patients with incomplete data sets. Patients who underwent either anterior or posterior vault remodeling were compared.

RESULTS: A total of 162 patients were included in this study. Patients undergoing anterior CVR were significantly older than those undergoing posterior CVR (13.3 vs. 11.0 months, p<0.015) and also had significantly greater intraoperative red blood transfusion volumes (20.3 vs. 15.3cc/kg, p=0.0207) and longer operative time than posterior CVR patients (274.9 vs. 216.7 minutes p<.00001). There were no significant differences between groups with regards to revision rate and complications. Calvarial bone was successfully split in 100% of cases.

CONCLUSION: This surgical approach to results in satisfactory surgical outcomes with a low recurrence rate, while also maximizing operative efficiency, and minimizing total blood loss and transfusion volume. This technique can be applied to any affected suture in a patient with craniosynostosis.

Differences in Perioperative Risk Factors between Single-Suture and Multi-Suture Craniosynostosis

Presenter: Alexander H. Sun, BS

Co-Authors: Kevin Nguyen, MS; Michael Alperovich, MD, MSc

Affiliation: Yale School of Medicine, New Haven, CT

PURPOSE: Single-suture craniosynostosis (SSC) and multi-suture craniosynostosis (MSC) are heterogeneous groups of conditions that often require similar management. While SSC tends to be predominantly non-syndromic and MSC tends to be more commonly syndromic, there has been little research evaluating the perioperative risks associated with surgical management for each group. This study aims to use data from the Pediatric National Surgical Quality Improvement Program (Pediatric NSQIP) to characterize perioperative morbidity involving single-suture versus multi-suture disease.

METHODS AND MATERIALS: All available Pediatric NSQIP data through 2016 was acquired and cranioplasty cases were selected using current procedural terminology (CPT) codes 61550, 61558 and 61559. CPT 61550 was coded as single-suture craniosynostosis (SSC) and CPTs 61558 and 61559 were coded as multi-suture craniosynostosis (MSC). Demographic information and perioperative variables were compared between the two groups, including age, comorbidities, total length of stay, operative time, American Society of Anesthesiologists (ASA) physical status classification, thirty-day readmissions, thirty-day reoperations, and wound infection rate. Data was analyzed in JMP statistical software (SAS Institute, Cary, NC).

Experience. Using the Pediatric NSQIP data available, 678 patients were found to have received surgery for SSC, while 1,817 had surgery for MSC.

RESULTS: Based on this data, a greater percentage of SSC patients had lower ASA classifications, while MSC patients...
tended to have higher ASA classifications (p<0.0001). The MSC patients also had lower operation times (p<0.0001) and longer hospital stays (p=0.0001). Additionally, MSC patients had higher rates of unexpected reoperation (p=0.019) and greater postoperative complication rates (p<0.0001). Because age was noted to be significantly different between the SSC and MSC groups, age-matching was then performed between the two groups to control for age. Once age was controlled, ASA class was no longer significantly different between groups. However, bleeding was still significantly different (p<0.0001), and operative time (p<0.0001) and hospital stay (p<0.0001) were still longer in the MSC group. However, the occurrence of postoperative complications as a whole was no longer significantly different between groups (p=0.187), and neither was the reoperation rate (p=0.509).

CONCLUSION: Multi-suture craniosynostosis patients tended to have shorter operative times and longer hospital stays, which was a significant difference even after age-matching. Nevertheless, age, more than type of craniosynostosis, was the most critical predictor of postoperative complication in single-suture versus multiple suture craniosynostosis.

Is Ketorolac Safe in Cranial Vault Remodeling Surgery?

Presenter: Fatma Betul Tuncer, MD

Co-Authors: Ananth Murthy, MD; Niyant Patel, MD

Affiliation: Akron Children’s Hospital, Akron, OH

BACKGROUND: Ketorolac is a nonsteroidal anti-inflammatory drug (NSAID), which has been shown to effectively control postoperative pain rather than narcotics alone in different studies. Many surgeons are reluctant to use ketorolac following major surgeries because of a theoretical increased risk of bleeding associated with NSAIDs. Our goal in this study is to assess the risk of postoperative bleeding associated with ketorolac use after cranial vault remodeling (CVR) surgery and to investigate its safety profile and possible secondary benefits.

METHODS: All patients undergoing CVR for single/multi suture synostosis at a single institution over 56 months were retrospectively reviewed. Patients undergoing limited craniectomies were excluded. A total of 74 consecutive patients included in the study were divided into two groups: 43 in ketorolac and 31 in the control group. The primary outcome was the risk of bleeding associated with ketorolac use in this population. Secondary outcomes were other side effects of ketorolac such as intracranial hemorrhage, gastrointestinal bleeding or renal insufficiency. Primary outcome was investigated by intraoperative and postoperative transfusion rate and change in hemoglobin (Hb) over the postoperative period. Total analgesic use, emesis and oral intake were also analyzed separately for each patient. Discharge Hb was expressed as a percentage of the first postoperative hemoglobin (postop Hb). Patient demographics and perioperative details were also analyzed.

RESULTS: Groups (ketorolac vs control, respectively) showed no statistically significant differences in terms of age (1.1 vs 0.9, p=0.21), operative time (320 min vs 319 min, p=0.9) or type of suture synostosis (simple vs complex, 13/30 vs 8/23, p=0.6). Only significant difference between the groups was the higher ratio of posterior CVR to anterior CVR in ketorolac group (24/19 vs 7/24, p<0.01). Postoperative and intraoperative transfusion rates were similar between the groups (1/43 vs 2/31 and 7/43 vs 9/31, respectively). Mean discharge hemoglobin values in both groups were lower than the first postop Hb (9.2 vs 8.2 mg/dL in ketorolac group, 9.7 vs 9.1 mg/dL in control group). Ketorolac group showed a similar decrease in Hb to the control group (%10 vs %8.1, p=0.39). There was no incidence of bloody emesis suggesting gastrointestinal hemorrhage, no focal neurological deficits which would otherwise require imaging studies for intracranial hemorrhage, or no renal insufficiency. Patients in ketorolac group required less opioid for pain management (p=0.02) and had a shorter length of stay in the hospital (2.1 vs 2.6 days, p=0.04). Oral intake and number of emesis episodes were similar in between the groups.

CONCLUSION: This study provides evidence for safe administration of ketorolac in pediatric patients following major cranial vault remodeling surgery with secondary benefits such as less opioid consumption and shorter hospitalization.