

# PERIOPERATIVE COMPLICATIONS ASSOCIATED WITH BRACHIAL PLEXUS REPAIR IN INFANTS

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**This report details the complications experienced during 100 consecutive cases of brachial plexus surgery in infants. There were eight perioperative complications. There was no mortality or permanent sequelae from any complication.**

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## INTRODUCTION

Over the past decade, early operative intervention has become the treatment of choice for infants with brachial plexus birth injuries who fail to demonstrate appropriate spontaneous recovery during the first 3–8 months of life (Gilbert, 2001; Kay, 1998; Sherburn et al., 1997; Sloof, 1995). In spite of the rapidly increasing number of surgical cases performed, little attention has been given to perioperative management, including anaesthetic techniques and associated surgical risks (Birch, 2000; Borrero, 2001; Hazama et al., 1999; La Scala et al., 2001; Seveso et al., 1983). This report analyses the perioperative complications in a series of operative cases.

## PATIENTS AND METHODS

The hospital, surgical, and anaesthetic records of 100 consecutive cases (1998–2000) of brachial plexus repair in infants who sustained brachial plexus birth trauma were retrospectively reviewed. A single surgeon performed all of the procedures. Anaesthesia was administered by senior members of a paediatric anaesthesia department at a large, dedicated children's hospital. The patient population consisted of 51 male infants and 49 female infants. The average age at surgery was 41 weeks and the average weight at surgery was 9.50 kg. The average surgical time was 7.3 h. Seventy-five cases were upper/middle (C5, C6, ±C7) plexus lesions and 25 cases were total lesions. Ninety-six patients underwent nerve-grafting procedures. No intercostal transfers were used. One patient (Case 1) had a phrenic nerve injury. Twenty infants underwent simultaneous shoulder reconstruction (posterior capsuloplasty and/or subscapularis slide).

## RESULTS

Eight perioperative complications were noted. Five complications were intraoperative and involved wheezing, increased rhonchi, and transient CO<sub>2</sub> changes while under anaesthesia. These may have been related to bronchospasm since relaxing agents were not used. All patients were treated with intraoperative albuterol and

their postoperative courses were all uneventful. Three immediate postoperative complications were noted as follows.

### Case 1

A 15-month-old male infant underwent surgery to repair a severe right upper brachial plexus injury associated with a premature breech delivery at 26 weeks gestation. The patient presented with total failure of recovery of shoulder function and elbow flexion. Brochopulmonary dysplasia was noted at birth. Aside from right diaphragmatic paralysis, he was healthy at the time of surgery. Intraoperatively, he was found to have a complete phrenic nerve disruption and an intraforaminal rupture of C5. Surgery consisted of various nerve repairs with grafts from C6 to the upper trunk and transfer of the spinal accessory nerve to the supra-scapular nerve. Postoperatively, the infant had persistent shortness of breath with bronchitis and bronchiolitis. He was maintained on a diuretic and postoperative albuterol treatments. He was discharged on the ninth postoperative day and his subsequent postoperative course was uneventful.

### Case 2

A 6-month-old, otherwise healthy female infant was admitted for a left brachial plexus repair. Intraoperatively, she was found to have a significant C5/C6 upper trunk lesion, which was reconstructed by neuroma excision and sural nerve grafting. Postoperatively, the child refused oral intake for 1 week and was noted to have otitis media, which had not been noted on the preoperative paediatric examination, and an upper respiratory tract infection. She began tolerating food and drink on the seventh postoperative day and was discharged on the ninth postoperative day. The postoperative course was otherwise unremarkable.

### Case 3

A 5-month-old male infant with a total right brachial plexus lesion underwent reconstruction with neuroma excision and sural nerve grafting. Postoperatively, he had persistent upper respiratory congestion with

evidence of an upper respiratory infection. Postoperative oral feeding was poor. He was maintained on intravenous fluids for 6 days with albuterol nebulization treatments. He began tolerating adequate oral sustenance on the seventh postoperative day and was discharged on the ninth postoperative day. The subsequent postoperative course has been uneventful.

## DISCUSSION

Previous reports in the anaesthesia literature have described a variety of potential postoperative complications associated with brachial plexus surgery in neonates (Hazama et al., 1999; Seveso et al., 1983). In addition to respiratory abnormalities including atelectasis,  $PCO_2$  elevation, and increased bronchial secretions; problems with body temperature control have also been noted. More recently additional complications such as phrenic nerve injury (Birch, 2000; Borrero, 2001), pneumothorax, chylothorax, fluid overload, and pulmonary oedema have been noted (La Scala et al., 2001).

In this retrospective report we have carefully reviewed a consecutive series of 100 cases from both surgical and anaesthetic perspectives. Certain features are associated with the low incidence of perioperative complications. First, all procedures were performed by the same surgical team. Second, all patients are evaluated by a paediatrician 24–48 h before surgery. Third, our anaesthetic technique utilised a continuous narcotic infusion which not only permitted consistent and reproducible intraoperative neurophysiologic studies, but also, when compared to a smaller series using inhalation agents, appeared to allow for a smoother postanaesthetic course with decreased agitation. This technique limits the need for significant or prolonged postoperative sedation or analgesia. Temperature monitoring with a nasopharyngeal probe and precise fluid management further reduce morbidity. Careful intraoperative dissection using the operating microscope and intraoperative neurophysiology aids in preventing iatrogenic injury.

These data further support the relatively safe nature of these lengthy and complex operative procedures when performed by experienced personnel in an appropriate paediatric surgical environment. With the exception of

Case 1, we have not found any factors in the patients with intra- or postoperative problems that would distinguish them from the uneventful cases. As with any long operative procedure, especially in infants, the potential for serious morbidity and even mortality exists. However, parents should not be discouraged from treatment of their child's brachial plexus injury due to fear of surgical complications.

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## References

- Birch R. Obstetrical brachial plexus palsy. In: Gupta A, Kay SP, Scheker LR (Eds). *The growing hand*. St Louis MO, Mosby; 2000: 461–474.
- Borrero J. Surgical technique. In: Gilbert A (Ed). *Brachial plexus injuries*. London, Martin Dunitz, 2001: 181–204.
- Gilbert A. Indications and strategy. In: Gilbert A (Ed.) *Brachial plexus injuries*. London, Martin Dunitz, 2001: 205–210.
- Grossman JAI (2000). Early operative intervention for birth injuries to the brachial plexus. *Seminars in Pediatric Neurology*, 7: 36–43.
- Hazama A, Kinouchi K, Kitamura S, Fukumitsu K (1999). Brachial plexus birth injuries: anaesthesia for surgical nerve reconstruction and preoperative myelography and computed tomographic myelography. *Paediatric Anaesthesia*, 9: 403–407.
- Kay SP (1998). Obstetrical brachial palsy. *British Journal of Plastic Surgery*, 51: 43–50.
- La Scala GC, Rice SB, Clark HM (2001). Complications of microsurgical reconstruction of obstetrical brachial plexus palsy. A series of 173 consecutive patients. *Congress of the International Federation of Societies for Surgery of the Hand (IFSSH)*. Istanbul, Turkey, 10–14 June.
- Seveso M, Pacelli L, Scaravilli P et al. (1983). Anesthesiologic problems in the surgical treatment of obstetric paralysis of the brachial plexus in the newborn infant. *Minerva Anestesiologica*, 49: 725–732.
- Sherburn EW, Kaplan SS, Kaufman BA, Noetzel MJ, Park TS (1997). Outcome of surgically treated birth-related brachial plexus injuries in twenty cases. *Pediatric Neurosurgery*, 27: 19–27.
- Sloof AC (1995). Obstetric brachial plexus lesions and their neurosurgical treatment. *Microsurgery*, 16: 30–34.

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