Brachial plexus palsy after Nuss procedure for pectus excavatum

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ABSTRACT
Brachial plexus palsy rarely occurs after Nuss procedure for pectus excavatum. Brachial plexus palsy after surgery may be caused by nerve tension and compression related to surgical positioning. In this article, we report a 21-year-old male patient of brachial plexus palsy after Nuss procedure revealing a narrowing of the costoclavicular space from 7.60 mm to 2.83 mm and an increase to 4.51 mm after upper bar removal. Patient’s symptoms were fully recovered. Our results showed that narrowing of the costoclavicular space after Nuss procedure might trigger brachial plexus palsy and that brachial plexus palsy may not be related to surgical positioning.

Keywords: Brachial plexus palsy, complication, minimally invasive surgery, pectus excavatum.

ÖZ

Anahat sözüklüklü: Brakial pleksus palsisi, komplikasyon, minimal invazif cerrahi, pektus ekscavatum.

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prevent excessive stretching and compression of the brachial plexus. After the procedure, he complained of severe weakness of the left arm. The left deltoid, biceps, and brachioradialis muscles had strengths of Medical Research Council (MRC) grade 1/5. Electrodiagnostic study revealed reduced recruitment at the deltoid, biceps, brachioradialis, and triceps muscles. The conduction studies were normal. Chest CT demonstrated narrowing of the shortest costoclavicular distance after Nuss procedure from 7.60 mm to 2.83 mm (Figure 1a, b). We removed the upper bar on post-procedure day four. After reoperation, the shortest costoclavicular distance was increased to 4.51 mm (Figure 1c) and the weakness of the arm was slightly improved. On post-reoperation day two, the interference patterns of the deltoid, biceps, and brachioradialis were increased with normal conduction studies. On post-reoperation day 23, the strength of left deltoid, biceps, and brachialis was above MRC grade 3/5. Full recovery from motor and sensory symptoms was achieved at three-month follow-up. A written informed consent was obtained from the patient.

**DISCUSSION**

Nuss procedure is a minimally invasive surgery, in which metal bars are inserted with tiny skin incisions to repair pectus excavatum. Brachial plexus palsy has rarely been reported as a complication after Nuss procedure for pectus excavatum. Early detection of BPP and understanding the mechanisms are important, and prompt treatment can improve BPP symptoms.

Postoperative BPP is attributed to two mechanisms: nerve tension and compression, related to surgical positioning. A fresh-cadaver study showed that the tension of the brachial plexus increased with the degree of arm abduction and that 90° abduction of the arm with 30° extension caused maximal tension of the nerve. Another fresh-cadaver study reported compression of the brachial plexus in the costoclavicular space with maximal shoulder abduction and external rotation position. Avoiding >90° shoulder flexion or abduction was suggested to prevent excessive stretching and compression of the brachial plexus.

Additional mechanisms may mediate BPP after Nuss procedure. A study measuring the distance between the clavicle and the first rib on the chest CT before and after Nuss procedure demonstrated significant changes in the costoclavicular space. Our case study also showed narrowing of the costoclavicular distance after Nuss procedure and an increase after a rearrangement operation. This mechanism, resembling a pump handle action in respiration, might be related to BPP after Nuss procedure. In our case, the neurologic symptoms of the patient began to improve immediately after removal of the upper bar and we thought that BPP was due to the narrowing of the costoclavicular space.

In this article, we described a rare case of brachial plexus palsy caused by compression of the costoclavicular space after Nuss procedure. Our results showing not only the mechanism related to surgical positioning, but also the postoperative changes in the costoclavicular space after Nuss procedure suggest the importance of early reoperation to relieve brachial
plexus palsy symptoms. Further large-scale studies investigating the effect of Nuss procedure on the costoclavicular space are needed to confirm the clinical significance of our findings.

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