Tanaffos (2008) 7(4), 24-26

Pulmonary Complications of Concave Rib Osteotomies in Scoliotic Patients

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ABSTRACT

Background: *Operations such as anterior or posterior releases can be used to decrease the magnitude of spinal curves. Concave rib osteotomy is an example of posterior release. Pulmonary complications are the main complications of this operation and the major cause of related morbidities. In this study, the frequency of pulmonary complications was evaluated.*

Materials and Methods: *Pulmonary complications of concave rib osteotomies were studied in a series of 14 patients at Sina Hospital in a 2-year period (2001-2003).*

Results: *Eight patients were females and 6 were males. During the operation, 3 cases of pleural tear were detected and chest tubes were inserted for them. No cases of pneumothorax and only 1 case of asymptomatic pleural effusion were detected postoperatively.*

Conclusion: *This operation is a simple procedure. If the valsalva maneuver is used and pleural tears are detected intraoperatively, pulmonary morbidities will not increase significantly.* ***(Tanaffos 2008; 7(4): 24-26)***

Key words: *Scoliosis, Osteotomy, Pulmonary complications, Morbidity*

INTRODUCTION

Scoliosis is a lateral deviation and transverse rotation of the spine. As the curves progress, in addition to cosmetic problems, complications such as cardiopulmonary problems and back pain develop (1). Anterior and/or posterior releases are surgical options for increasing the flexibility of a rigid curve. Anterior release procedure comprises ligament release and discectomy.

Complications such as vascular damage are relatively common in anterior approaches. There are limited data available in the medical literature assessing the effect of an anterior release on coronal flexibility of scoliosis (2).

In order to decrease complications and improve the chance of correction, posterior release procedures were introduced. Concave rib osteotomy is one of the posterior release procedures. This procedure is very effective for curve correction, but pulmonary morbidities are high. Pulmonary morbidities with this

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Received: 28 January 2008

Accepted:8 November 2008

procedure increase by 30% postoperatively. Chest tubes must be inserted prophylactically after the procedure (3).

MATERIALS AND METHODS

This prospective study was performed on scoliotic patients admitted to the Sina Hospital from 2001 to 2003. Posteroanterior and lateral chest radiography were obtained for each patient. All patients had acceptable PFT (Pulmonary Function Tests) for general anesthesia. These patients underwent concave rib osteotomy and posterior fusion. In this study we used Mann's technique (3) for concave rib osteotomy. We approached the concave ribs through the midline incision used for the instrumentation and spinal fusion. Then, we retracted the paraspinous muscle lateral to the tips of the concave transverse processes.

We incised the periosteum along the rib axis for 1.5cm lateral to the transverse process and used small elevators to expose the rib posteriorly. We protected the pleura with elevators and we used a rib cutter to section the rib approximately 1cm lateral to the transverse process. Then we placed a small piece of thrombin-soaked gel foam between the rib and the pleura for protection and hemostasis. At this point, we asked the anesthesiologist to do a valsalva maneuver. If we detected a pleural leak during the maneuver, we would insert a chest tube; otherwise, we would not. We examined the patient after the operation for signs or symptoms of pulmonary complications especially pleural effusion.

We obtained a second chest x-ray for each patient. Chest radiographies were reviewed by 3 separate expert radiologists. Another chest x-ray was obtained for detection of any pleural effusion one week later. We did not insert prophylactic chest tubes post-operatively.

RESULTS

Of 14 patients, 8 were females (57.14%) and 6 were males (42.86%), with a mean age of 16 years (range 11-20 yrs). The mean preoperative curve magnitude was 93.63 degrees and the mean postoperative curve magnitude was 61.89 degrees. The mean blood loss during the operation was 1.85 units packed cell (0-4 units packed cell). During the intraoperative valsalva maneuver 3 pleural tears were detected and treated by chest tube insertion. The mean duration of time for performing concave rib osteotomy was 20 minutes (range 15-52 minutes). There was no case of pneumothorax postoperatively. There was only one case of mild pleural effusion that was asymptomatic and detected only by CXR. Table 1 shows our findings.

Table 1. Findings in our study.

Sex	Female: 8 Male: 6
Age	Mean: 16 yrs Range:11-20 yrs
M.P.C.M*	Preoperative: 93.63 Preoperative: 61.89
M.B.L**	1.8 UPC***
Operation time	Mean :20 min Range: 15-25 min
Pulmonary complication	Pneumothorax: 0 Pleural effusion: 1

*M.P.C.M=Mean Preoperative/Postoperative Curve Magnitude,
**M.B.L=Mean Blood Loss,
***UPC=Unit Packed Cell, OP=Operation

DISCUSSION

There are few studies in the English literature about the complications of concave rib osteotomies. Most recommended prophylactic chest tube insertion for patients post-operatively in order to prevent pulmonary complications. Although we did not insert

prophylactic chest tubes, we did not detect any obvious pulmonary complications postoperatively.

The concept of concave rib osteotomy was first introduced by Flinchum in 1963 (4). Kahn stated that the sectioning of the ribs aids in allowing derotation(5). Researchers in a biomechanical analysis of the spine stated that the stabilizing effect of ribcage was due to its tube form and several ribs must be removed before increasing the spinal flexibility (3). This concept was tested further in a cadaver study by Halsall et al. He found that "only rib resection on the scoliotic concavity significantly increased the spinal flexibility" (6).

In two recent studies it was shown that the single posterior approach with posterior release by opening the facet joints and osteotomy of the concave ribs was more efficient in increasing the spinal flexibility than excision of intervertebral discs (7, 8). One of the major risks associated with this useful procedure is the occurrence of pulmonary complications. Goldstein reported 5 pleural effusions and 3 pneumothoraxes in 17 patients receiving this procedure (9).

Mann et al. reported 2 pleural effusions and 1 pneumothorax in 10 patients. According to Mann's study if concave rib osteotomy has been done, a prophylactic chest tube should be inserted (3).

In this study, we did not follow this recommendation as a routine because most surgeons do not recommend insertion of a chest tube prophylactically in a thoracoplasty procedure; this is more extensive than the rib osteotomy. On the other hand, they recommend doing valsalva maneuver intraoperatively and only if a pleural tear is detected during the procedure, a chest tube should inserted. We followed this recommendation in our study. There were only three pleural tears detected during intraoperative valsalva maneuver. In these cases, we inserted chest tubes. There were no significant pulmonary morbidity, postoperatively.

In conclusion, concave rib osteotomy is a simple and safe procedure. The valsalva maneuver done during the operation detects pleural tearing. Insertion of a chest tube in this situation will not increase pulmonary morbidities significantly. However, we strongly recommend postoperative physical an radiological exams to detect any pulmonary morbidities.

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