Ultrasound-Guided Extrapleural Nuss Procedure for Pectus Excavatum Repair

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The minimally invasive Nuss procedure has been widely utilized to treat pectus excavatum. In the present study, intraoperative ultrasonography to guide placement of a Nuss bar, instead of thoracoscopy, is described. This technique may be a simple and safe method to avoid cardiac injury.

The Nuss procedure has been performed clinically for more than 2 decades to treat pectus excavatum, the most common chest wall malformation in humans [1]. Special techniques or modifications have been developed to reduce complications associated with the Nuss procedure [2, 3]. However, one of the most severe complications, heart injury, remains even with thoracoscopic visualization. We have developed a safe and feasible extrapleural Nuss procedure using intraoperative ultrasonography to safely guide placement of the Nuss bar.

Technique

Our previous technique has been an extrapleural Nuss procedure [2]. Although this previous experience was successful, we have been concerned about the possibility of cardiac injury. This concern led us to explore ultrasonographic visualization as a means to avoid this complication. This report describes our new technique. A water-filled balloon is placed in the sternal depression to facilitate ultrasound visualization (Fig 1). Ultrasonography can measure the distance between the inner table of the sternum and the pericardium, monitor creation of an extrapleural tunnel bilaterally, and guide the dissector tip, placed laterally to the sternum, during its passage between the sternum and pericardium to the opposite side, avoiding cardiac injury (Fig 2).

From January 1, 2013, to December 1, 2013, 4 patients with pectus excavatum successfully received ultrasound-guided extrapleural Nuss Procedure at Tangdu Hospital, Xi’an, China. Compared with our previous technique [2], the current procedure is slightly longer. There has been no blood loss or pneumothorax.

Comment

The most dangerous maneuver during the Nuss procedure is placement of the dissector through the space between the sternum and the heart. Even with the help of thoroscope, the risk of cardiac perforation still exists [3]. Several methods have been developed to avoid this life-threatening complication. For example, special instruments have been designed to elevate the chest wall and the sternum [4–6]. A modified bilateral thoracoscopic approach was recommended [3]. Despite these techniques, a portion of the retrosternal space may still not be visible. Additional incisions and technique may cause more pain.

Here, we reported a new method of using intraoperative ultrasonography to guide the dissector and the Nuss bar insertion. This method has certain advantages. First, the whole surgical procedure can be directly monitored by ultrasonography, which may reduce the potential injury to the pericardium and to the heart. Second, our technique can be used in patients who have an obliterated pleural cavity, where thoracoscopy would be hazardous.

Accepted for publication April 4, 2014.

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Although our experience is small, we believe the described technique may make the Nuss procedure safer, by avoiding the most serious complication—cardiac perforation.

The authors would like to thank Drs Yonggang Zhou and Hongkui Gao for performing the intraoperative ultrasonography guidance. We greatly appreciated Dr Mingyao Liu, Professor of Surgery, Faculty of Medicine, University of Toronto, for critically reading and revising this manuscript.

References