

Using the reciprocating saw for resternotomy

Resternotomide ileri geri hareketli testere kullanımı

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Contrary to a prevailing practice advocating the use of an oscillating saw for sternal re-entry, some surgeons prefer using a reciprocating saw in cases of resternotomy. In this article, we describe a simple technique for resternotomy using a reciprocating saw. This technique has been used in 158 consecutive patients representing the routine resternotomy practice of two surgeons. Only one patient had a significant bleeding requiring urgent institution of cardiopulmonary bypass. No mortality related to resternotomy was seen.

Key words: Reciprocating saw; resternotomy; sternum/surgery.

Cardiac reoperations which necessitate resternotomies are associated with potential major complications. An injury to the heart, great vessels, or previously implanted patent coronary bypass grafts can lead to massive hemorrhage and/or myocardial ischemia and infarction.^[1-5]

Given these potential risks, many techniques have been described to increase the safety of sternal re-entry. Most of the published reports, however, share a common view that an oscillating saw is preferable to ensure a safe procedure.^[1-3] The current paradigm gaining widespread acceptance among cardiac surgeons demonizes the use of a reciprocating saw in these cases without producing much supporting evidence. Against this notion, some surgeons have been trained in the use of the reciprocating saw for this type of surgery and continue to use them. The purpose of this article is to describe the technique used to perform a safe resternotomy using a reciprocating saw.

Resternotomide salınımlı testere kullanımını benimseyen yaygın uygulamaya karşın, bazı cerrahlar ileri geri hareketli testere kullanmayı tercih eder. Bu makalede, ileri geri hareketli testere kullanılarak yapılan resternotomi için basit bir teknik tanımlandı. Bu teknik, rutin resternotomi uygulaması sergileyen iki cerrah tarafından 158 ardışık hasta üzerinde uygulandı. Yalnızca bir hastada acil kardiyopulmoner baypas gerektiren önemli düzeyde bir kanama görüldü. Resternotomiye bağlı mortalite görülmedi.

Anahtar sözcükler: İleri geri hareketli testere; resternotomi; sternum/cerrahi.

SURGICAL TECHNIQUE

Preoperative contrast-enhanced computed tomography (CT) is only offered to patients who have previously used prosthetic patches and/or conduits involving the aorta or the right ventricular outflow tract as well as those with patent coronary bypass grafts.

Intraoperatively, following skin incision, the sternal wires are cut and removed, and blunt dissection is performed superiorly around the sternal notch with the finger. The linea alba is then divided for a few centimeters inferiorly from the xiphoid process while maintaining upward traction, and 5 to 6 cm of the retrosternal space is cleared of adhesions mostly via blunt dissection along the posterior sternal table. Prior to sawing the sternum, ventilation is stopped to allow the pleura and adjacent soft tissues to fall away from the sternum. The sternum is then divided along the previously defined midline with a reciprocating saw (Aesculap, a division of the B. Braun Melsungen AG,



Available online at
www.tgkdc.dergisi.org
doi: 10.5606/tgkdc.dergisi.2013.6945
QR (Quick Response) Code

Received: April 2, 2012 Accepted: July 18, 2012

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Tuttlingen, Germany) from the xiphoid upwards. At this point, two technical details are crucial in order to avoid injury to the underlying structures. The first is to ensure that the saw is snugly lifted against the sternum and slightly tilted backwards. This allows the protective foot piece of the saw to further develop a safe plane retrosternally ahead of the sternal cutting and prevents the saw from cutting freely into any underlying soft tissue structures. Secondly, the saw is to be advanced in a to-and-fro motion rather than a continuous one to allow the protective foot piece of the saw to disengage from substernal adhesions, thus creating a safe pathway for sawing. Following sternal division, hemostasis is achieved along the posterior aspect of the sternum, and further dissection is carried out in the normal fashion.

DISCUSSION

The technique described was used in 158 consecutive re-sternotomy cases between March 2003 and April 2010, representing the practice of two surgeons who routinely use the reciprocating saw for this procedure. Their choice of the reciprocating saw was based solely on their previous training. Consequently they had a higher level of comfort with this instrument than if they had used an oscillating saw. Although many of these patients (n=68, 43.0%) were deemed to be high-risk at sternal re-entry due to multiple previous sternotomies, previous mediastinitis, patent grafts, or the need for right-sided intervention, there was only a single occurrence (0.6%) of catastrophic hemorrhage that necessitated the urgent institution of cardiopulmonary bypass (CPB) through the femoral vessels. Two other minor injuries to the right atrium and right ventricle also occurred and were managed by simple stitches. There was no mortality that could be attributed to sternal re-entry, and this low injury rate compares well with the rates found in previously published reports.^[1-4] Morales et al.^[5] examined 12 retrospective studies and found a 0.5-3.6% incidence of catastrophic hemorrhage. They also noted a discrepancy between the survey findings and published injury rates, which likely reflects the underreporting of re-sternotomies related to injuries in the literature.

The use of a reciprocating saw for sternal re-entry is currently being adopted by an increasingly smaller number of surgeons, as evidenced by previously published questionnaires. One questionnaire circulated by Dobell and Jain was probably the first evidence of a paradigm embracing the oscillating saw for this surgical procedure^[1] They discovered that the majority of responders preferred the use of an oscillating saw. Only one out of the 131 surgeons questioned indicated a preference for the reciprocating saw. Another questionnaire showed that a minority of surgeons (153

out of 1,116) would use the reciprocating saw for a re-sternotomy, but this survey provided no further portrayal of the exact techniques that should be used.^[2] The reported higher incidence of injury on sternal re-entry among these surgeons is obviously subject to a much potential bias. Furthermore, these questionnaires notoriously neglected other more important predictors of injury at the time of re-sternotomies, such as multiple previous re-sternotomies, a patent internal mammary artery graft, or a history of mediastinal radiotherapy.^[3,4]

More recently, Roselli et al.^[3] reviewed 1,847 re-sternotomy cases and recommended the routine use of the oscillating saw. However, another large retrospective series by Park et al.^[4] examined 2,555 cases of sternal re-entry, but they did not specify the type of saw being used due to different preferences among the surgeons.

In cases where the aorta, right ventricle, or patent bypass grafts have become firmly adherent to the back of the sternum, an injury would likely occur whether an oscillating or a reciprocating saw was used, even with adequate experience and attention to technical details. The technical tips permitting for the safe use of reciprocating saws in re-sternotomies, as detailed in our operative techniques, have been previously reiterated in an published article by Diethrich^[6] which narrated how the reciprocating saw was originally developed to avoid injury to the dura mater during a craniotomy.

In conclusion, the reciprocating saw can safely be used for re-sternotomies. Rather than advocating a particular type of saw, attention should be directed to the identification of other more important predictors of injury and the institution of preemptive protective measures.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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