Improved Technique of Nitinol Sternal Clip Application

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Many cardiac surgeons are becoming increasingly familiar with the advantages and application of nitinol sternal thermo-reactive clip (Flexigrip; Praesidia, Bologna, Italy) in sternotomy closure. However, we will be describing an alternative technique of flexigrip clip application that is even easier to perform, with additional advantages of a more precise measurement of sternal width and allowed identification of sternal midline before sternotomy.

In recent years indications and advantages for the use of Flexigrips (Praesidia, Bologna, Italy) in sternal closure have been well established [1, 2]. Three Flexigrips are usually applied onto the second intercostal, third intercostal, and fourth intercostal spaces, respectively, at the end of the cardiac procedure when the sternum is approximated. Holes are created at the edges of the sternum with diathermy, using the measuring device to estimate the sternal width at each intercostals space, and the surgeons are able to apply the flexigrip of appropriate size. This technique was introduced by Centofanti and colleagues [1].

However, when using the Flexigrip (Praesidia) measuring device to measure the actual width of a divided sternum, difficulty and uncertainty can exist due to certain factors. Sometimes the sternum is quite soft and friable, or even deformed and may also have been fractured at its edges by the retractor due to prolonged use during a long procedure. These factors may result in oversizing or undersizing the Flexigrip, with possible consequences of sternal malunion or dehiscence.

**Technique**

We describe an alternative technique of the Flexigrip application, which we have found overcomes the potential problems previously mentioned. This involves simply measuring the sternum before sternotomy (Fig 1). There are several advantages of measuring the sternum at the point of initial chest opening before sternotomy and...
before anti-coagulating the patient with large doses of heparin. Using this technique, the precise width of the sternum can be measured both easily and accurately. It can also prevent ectatic sternotomy, as the holes created at the sternal edges help to identify the true sternal midline for precise sternal division. Moreover, any bleeding from the intercostals space can be controlled before heparin is given, rather than at the end of procedure when the patients are often suffering from coagulopathy. In addition, this technique allows ample time for the operating room nurse to prepare the nitinol clips that need to be immersed in sterile cold saline below 8°C to become malleable. When the sternum is approximated after completion of surgery, the correct sized Flexigrips are ready to be placed perfectly into each intercostals space (Fig 2). This technique also helps to avoid any delay in surgery caused by having to wait for the applicator and measuring devise to be sterilized in between cases, especially if there are only limited numbers of application units in the hospital. To date, we have performed over 50 cardiac procedures using this technique of Flexigrip application without complications.

Comment

In summary, we believe that this improved technique is safer and easier to perform. It is also the logical way of precise sternal measurement with accurate application of Flexigrip.

References