A new classification of post-sternotomy dehiscence
Uma nova classificação das deiscências após esternotomias

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Abstract

The dehiscence after median transeptal sternotomy used as surgical access for cardiac surgery is one of its complications and it increases the patient’s morbidity and mortality. A variety of surgical techniques were recently described resulting to the need of a classification bringing a measure of objectivity to the management of these complex and dangerous wounds. The different related classifications are based in the primary causal infection, but recently the anatomical description of the wound including the deepness and the vertical extension showed to be more useful. We propose a new classification based only on the anatomical changes following sternotomy dehiscence and chronic wound formation separating it in four types according to the deepness and in two sub-groups according to the vertical extension based on the inferior insertion of the pectoralis major muscle.

Descriptors: Thoracotomy. Surgical wound infection. Sternum. Postoperative complications.

INTRODUCTION

The median transsternal thoracotomy was first described as an access route in cardiac surgery in 1957¹ and, since then, is widely used. One of the complications is the dehiscence of edges that usually occurs after infection, and is associated with high rates of morbidity and mortality².

In cases of infection, the first-line treatment in the acute phase is early debridement, use of antibiotics and, in some cases, the use of retail of the pectoralis major muscle or omentum to improve vascularization. However, some patients develop dehiscence of the sutures and the chronicity of wounds³,⁴.

Some of dehiscence can be corrected only with debridement of the edges and its approach after improvement of the conditions of the tissues involved. For the correction of more complex defects, various techniques were being described including muscle, musculocutaneous and skin flaps, also omentum flaps with subsequent skin graftting, and recently the fasciocutaneous flap including the pectoralis major muscle fascia³⁴.

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Due to the recent increase of surgical options, it became necessary to classify these wounds in order to assist the decision-making process of the surgeons as to the best technique to be used, and to facilitate the exchange of knowledge in scientific reports. The first classification was described by Pairolero & Arnold in 1984, based on the postoperative time of establishment of the infection (Table 1), subsequently, Oakley in 1996 used the same criteria, but added risk factors of the establishment and attempts of treatment of the initial infection (Table 2).

Infections following a sternotomy are generically termed in the literature as mediastinitis, although infection may be limited to a tissue or anatomical area, not necessarily involving the mediastinum. Other terms are used: sternites, mediastinitis, dehiscence of sternotomy and post-sternotomy infection.

According to the Center for Disease Control and Prevention (CDC), the infection in surgical wounds after sternotomy should be classified into three types: (A) surface when only the skin and subcutaneous are involved; (B) when the infection reaches the sternum, but not affecting it, and (C) of cavity or organ when there is sternum osteomyelitis and/or when there is involvement of the mediastinum. These definitions clarify the site of infection, but do not keep exact correlation with the existing real anatomical change.

Jones et al. in 1997, suggested for the first time a classification based on the affected anatomical site but still using as parameter the presence of infection (Table 3). Greig et al. in 2007 proposed a classification based on the affected anatomical site (Table 4). The author was the first to specify the vertical extent of the wound, because it is recognized the more difficult to reconstruct the lower portion when it extends below the insertion of the lower border of the pectoralis major muscle. However, the concept of emphasizing only the location of the wound was not widely used in scientific reports and classifications based on infection continued to be the most used.

The recent expansion of the variety of surgical techniques and the discussion of their indications proved to be fundamental the anatomical description of the raw area to facilitate understanding and discussion of the results.

Consequently, we created a uniquely classification based on the depth and anatomical extent of the wounds which seemed to us to be more complete and objective. Initially, we

| Classification | Postoperative phase on which the infection occurs |
|---------------|--------------------------------------------------|
| Type I        | In the first week                                 |
| Type II       | Between 2 to 6 weeks                              |
| Type III      | After 6 weeks to years (in general are fistulas and chronic osteomyelitis) |

| Classification | Description |
|---------------|-------------|
| Type I        | Mediastinitis present in up to two weeks after the operation in the absence of risk factors |
| Type II       | Mediastinitis present in 2 to 6 weeks after surgery in the absence of risk factors |
| Type IIIA     | Mediastinitis type I in the presence of one or more risk factors |
| Type IIIB     | Mediastinitis type II in the presence of one or more risk factors |
| Type VAT      | Mediastinitis type I, II or III after treatment failure |
| Type IVB      | Mediastinitis type I, II or III after failure of one or more treatments |
| Type V        | Mediastinitis present for the first time after 6 weeks postoperatively |

| Classification | Depth | Description |
|---------------|-------|-------------|
| Type 1a       | Superficial | Skin and subcutaneous |
| Type 1b       | Superficial | Exposure of sutured deep fascia |
| Type 2a       | Deep   | Bone exposure, sternum with stable steel suture |
| Type 2b       | Deep   | Bone exposure, sternum with unstable steel suture |
| Type 3a       | Deep   | Necrotic bone exposure or fractured, unstable sternum, exposed heart Type 2 or 3 with septicemia |
| Type 3b       | Deep   | }
divided the surgical wound into four types, according to the depth affected: type I, when there is loss of skin and subcutaneous tissue; type II, when the bone is exposed; type III, when there is loss of bone tissue of sternum or ribs; type IV and when there is exposure of the mediastinum (Table 5). Next, we define whether it is partial or total in relation to its vertical extent and in the end whether it is of higher or lower position, considering as reference the inclusion of the lower margin of the pectoralis major muscle. To illustrate the use of this classification we present three examples of patients with chronic wounds in which different surgical techniques have been adopted based on anatomical changes of the surgical wound (Figures 1A, 1B, 2A, 2B, 3A, 3B). The result of the classification proposed in these cases was more precise and specific than if we used the classification methods previously used.

It should be noted that use the infectious process, related to the length of its establishment or its depth, as classification criteria seems to be inappropriate, since the infection is not the only cause of dehiscence of the edges in these patients, and surgical reconstruction is only performed when there is no infection at the site of dehiscence and possible donor sites.

Table 5. Classification proposed by the authors based on anatomical changes, considering the depth and location of the surgical wound. The limit that defines upper and lower region is the inclusion of the lower margin of the pectoralis major muscle.

| Classification | Affected tissues                      | Wound location as the vertical extension |
|---------------|--------------------------------------|----------------------------------------|
| Type I        | Skin and subcutaneous tissue         | Partial Upper | Total Lower |
| Type II       | Exposure of the sternum or ribs      | Partial Upper | Total Lower |
| Type III      | Bone loss of sternum or ribs         | Partial Upper | Total Lower |
| Type IV       | Exposed mediastinum                  | Partial Upper | Total Lower |

We therefore consider that this classification is objective and easy to understand, thereby facilitating the exchange of data. This favors the exchange of information between teams and systematises the evaluation of the success of the various existing surgical techniques.
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