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**Letter to the Editor**

**Reply to the Letter to the Editor**

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Keywords: Thoracoabdominal trauma; Diaphragmatic injury; Diagnosis

We appreciate the comments of Khalili and Sarkar [1] that they made concerning our paper about traumatic diaphragmatic rupture [2]. We also appreciate the fact that they mentioned the difficulties in the early diagnosis of right-sided diaphragmatic injuries. Meanwhile, we did not understand why they do not agree with our conclusion that a high index of suspicion is of utmost importance for the diagnosis of these patients, since they mentioned that a persistently elevated right hemidiaphragm on routine X-ray must arouse suspicion. Clearly, we reported 11 patients with right-sided injury where 2 of them had late diagnosis. Although the major complaint of these two patients was dyspnea, we agree with Khalili and Sarkar that a high index of suspicion should also be held when dealing with post-trauma patients who complain of persistent right-sided chest discomfort after trauma.

Furthermore, in our paper, we emphasized the sensitivities of radiological investigations, where a chest X-ray reached 17% sensitivity, while this rose to 50% with a CT in right-sided injuries. In other words, chest X-ray can be normal in such cases. Certainly, diagnosis can be elusive, as we stated. There are reviews questioning the role of each imaging method [3]. Shanmuganathan et al. highlighted that if the chest radiography is indeterminate, spiral computed tomography with thin sections and reformatted images is the next study of choice and magnetic resonance imaging is only used to evaluate the diaphragm for patients with clinical suspicion but an indeterminate diagnosis after chest radiography and spiral CT [4].

Herein, it is stated that detection of diaphragmatic injuries has improved with helical CT and should further improve with multisection CT for more accurate analysis of the diaphragm.

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**Letter to the Editor**

Simplified modified reinforced sternal closure

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Keywords: Reinforced sternal closure; Sternal

I read with interest the article by Schimmer and co-workers [1] about sternal closure techniques and postoperative sternal wound complications in elderly patients. Initially in my practice I tried the Robiscek technique for secondary closure, post dehiscence or mediastinitis. The Robiscek is still complex and requires two extra longitudinal wires, weaving in and out through all intercostal spaces, which causes more bleeding because of multiple punctures in the sternum and surrounding tissues in addition to the extra heavy metal net. I found those patients have slow healing and considerable post healing chest wall pain, most probably due to steel irritation. Later on, I applied the primary simplified reinforced sternal closure [2] in all patients expected to have postoperative healing problems and since implementation of this concept, all sternal complications decreased dramatically. Elderly, female, osteoporotics, faulty oblique or paramedian sternotomy and improper closure are the most important factors contributing to mechanical sternal instability, which may lead to malunion, dehiscence, infection and mediastinitis. This situation becomes more complicated in tracheostomy and valve replacement patients and ends up with a major morbidity or even mortality.

This technique utilizes a single longitudinal wire on each side with only two sternal punctures at the lower and upper parts of the sternum surrounded by the conventional transverse or figure-of-eight wires. This provides a really solid and stable sternum, which is the most important prerequisite to avoid sternal complications.

I found this way of closure is simple, efficient and less traumatic to the sternum.
Reply to the Letter to the Editor

Reply to Al Ebrahim

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We would like to thank Khaled Al-Ebrahim for his comments [1] on our paper regarding our results of the Robicsek sternal closure technique in elderly patients [2]. Nowadays, there are many sternal closure techniques available, but the routine use of a defined advanced sternal closure technique in the growing group of patients expected to have postoperative healing problems is still a matter of debate. Especially, if a more complex technique seems theoretically to be superior, it is not always able to achieve the requirements under "real-life" conditions for everybody.

Careful attention to haemostasis and meticulous surgical technique remain the mainstays of prevention of sternal dehiscence and must include precise sternal alignment and stable closure. All techniques claim to maximise sternal stability, but it is difficult to differentiate between the merits of various techniques. Depending on the amount of movement and tension placed on the point of contact, the bone will often fracture before the period of healing is complete. Especially if the sternum is unusually narrow or osteoporotic, or if it has been mishandled with sternum retractor, the wire sutures may easily cut through the bone with simultaneous transverse fragmentation and longitudinal separation [3].

I agree with your arguments that the Robicsek technique has its advantages (it stabilises the sternum if it is fragile or broken, or if subsequent instability develops, it prevents the wires cutting through the bone, it changes the point of contact from metal-to-bone to metal-to-metal), but it also has some disadvantages (it produces a constrictive weave that can disrupt the collateral blood supply of the sternum and effective approximation of the top and bottom of a gaping sternum cannot be obtained).

The technique described by Robicsek was modified by Sharma et al. [5] who placed a line of continuous wire suture on either side of the sternum and tied both lines cranially and caudally and caudally and Al-Ebrahim et al. [4] who utilise single longitudinal wire on each side with only sternal punctures at the lower and upper parts of the sternum surrounded by the conventional transverse or figure of eight wires. These techniques have an added advantage over conventional Robicsek’s closure in that the blood supply of the sternum is not 'strangulated' by the ring formed by encircling wires around the costal cartilages by anterior and posterior longitudinal wires.

The essential point of this issue is the prevention of sternal dehiscence and subsequent infection in the growing group of patients expected to have postoperative healing problems. In order to achieve more evidence in this matter we will publish in the near future the results of a prospective randomised multicentre trial comparing the Robicsek technique versus the conventional trans/peristernal technique (with >6 cerclages) not in a special subgroup but in all high risk patients (n = 815 patients; all with one or more inclusion criteria: diabetes mellitus, peripheral vascular disease, obesity, osteoporosis, old age, immunosuppressed state, preoperative renal failure, chronic lung disease). Obviously, it would have been of interest to involve your advanced technique as a third arm of this trial.

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