symptoms. Early diagnosis and intervention can avoid complications, migration, and/or death. If diagnosed after the injury, asymptomatic foreign bodies with no associated risks may be treated conservatively.⁵

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References

1. Mick SL, Abdullah I, Tchanchaleishvili I, Razo Vazquez AO, Gilfeather MS, et al. Sewing needles embedded in the cardiac interventricular septum and chest wall. *J Thorac Cardiovasc Surg.* 2010; 140:709-10.
2. Sersar SIE. Therapeutic approaches for inhalation of veil pins: local Egyptian experience. *ACTA Pediatr.* 2010;99:1269-72.
3. Kataoka H. Cardiac tamponade caused by penetration of acupuncture needle into the right ventricle. *J Thorac Cardiovasc Surg.* 1997;114:674-6.
4. Schechter DC, Gilbert L. Injuries of the heart and great vessels due to pins and needles. *Thorax.* 1969;24:246-53.
5. Perrotta S, Perrotta A, Lentini S. In patients with cardiac injuries caused by sewing needles is the surgical approach the recommended treatment? *Interact Cardiovasc Thorac Surg.* 2010;10:783-92.

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Reply to the Editor:

Thank you for your comments on our recent report¹ of thoracic imaging. The case you describe underscores the need for a complete history in these cases, as well as the need for use of imaging modalities sufficient to determine the location of thoracic foreign bodies to facilitate appropriate operative intervention, assuming that the patient is in stable condition.

Although we agree that chest radiography is helpful in the initial work up of an intrathoracic foreign body, the location of a foreign body lodged within the heart can remain ambiguous if this is the only imaging performed. Both the case you describe and our own case illustrate this point well. In our own case, the true position of the single intracardiac sewing needle among the 3 needles visualized on chest radiography was not clear until additional imaging modalities were used.¹ In your case, perhaps

the patient could have been spared the initial thoracotomy had additional imaging been performed preoperatively.

In the setting of an unreliable history, the quality of imaging becomes of paramount importance. Both this issue and the difficulty of the adequate localization of pins and needles in the heart have been described dating back almost 20 years.²

The relationship between inhaled, swallowed, and transthoracically introduced intrathoracic pins and needles and the heart is interesting. Because of the proximity of the bronchi and esophagus to the heart and the propensity of these small objects to migrate, we submit that cardiac injury should be considered any time an intrathoracic pin or needle is visualized within the mediastinum on chest radiography, regardless of the mode of entry. Indeed, there is at least one case reported of cardiac tamponade from the migration of a swallowed needle.³

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References

1. Mick SL, Abdullah I, Tchanchaleishvili V, Razo Vazquez AO, Gilfeather MS, Balcells E, et al. Sewing needles embedded in the cardiac interventricular septum and chest wall. *J Thorac Cardiovasc Surg.* 2010;140:709-10.
2. Morrison WG, Heyworth JR. Needle injury to the heart. *Arch Emerg Med.* 1992;9:54-7.
3. Vesna D, Tatjana A, Slobodan S, Slobodan N. Cardiac tamponade caused by migration of a swallowed sewing needle. *Forensic Sci Int.* 2004;139: 237-9.

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AN IDEA FOR CONSTRUCTION OF A NEW MODIFICATION OF THORACIC ENDOGRAFT FOR TREATMENT OF DELAYED PARAPLEGIA

To the Editor:

Delayed spinal cord ischemia after thoracic aortic aneurysm repair is an in-

frequent but devastating complication. According to previous results, paraplegia after endovascular treatment of thoracic aortic aneurysms occurs at some rate between 0% and 12%.¹ The mechanisms of spinal cord ischemia (SCI) in endovascular endografting are poorly documented, with a few mechanisms proposed.^{2,3} Regardless of the cause at the time of development, however, cerebrospinal drainage and mean arterial pressure manipulation are the only treatments currently available. A new and interesting treatment approach by Reilly and Chuter⁴ has led us to propose a novel endograft model to aid in the treatment of delayed paraplegia.

During thoracic endograft fabric creation, it is essential to plan a circle partial fenestration in the middle part of the graft. The diameter is estimated according to the previously performed experiments. That fenestration is then covered with patch slightly attached over the edges, completely fixed in less than half the circumference, with enough strength to be easily partially opened. That patch in turn is connected with wires to the introducer sheath left in the femoral artery after stent graft deployment, as a backup. In case of delayed paraplegia development, a string can be pulled to open the fenestration in the graft, allowing a type III endoleak to evolve. The force of blood flow then keeps the patch open (Figure 1).

The introduction of endovascular techniques as an alternative option for the treatment of thoracic aortic disease gave rise to some optimism because the risk of paraplegia seemed reduced to somewhere in the range of 0% to 6%.⁵ Nevertheless, the risk of SCI remains a constant threat, with only a very few treatment techniques that can give us some hope for better results. It should be mentioned that delayed paraplegia is somewhat more frequent after endovascular treatment of thoracic aortic aneurysms than after open thoracoabdominal aortic aneurysmal repair. Reasons for this difference,

FIGURE 1. Circular partial fenestration is created in the middle part of graft (A) and covered with a patch slightly attached over the edges, such that it can be easily partially opened, and connected with wires to the introducer sheath left in the femoral artery after stent graft deployment. In case of delayed paraplegia development, a string is pulled (B), opening fenestration in the graft and allowing type III endoleak to evolve (C).

however, are ill defined. The best approach to treatment of delayed SCI as a consequence of endovascular thoracic grafting, and in fact currently the only available approach, has been a combination of cerebrospinal fluid drainage and mean arterial pressure manipulations. Treatment with cerebrospinal fluid drainage and mean arterial pressure manipulations, however, has its own limitations. Our new idea for an endograft model could contribute to finding a better solution. As we all know, the main problem of SCI lies in reduction of anterograde perfusion through the spinal cord, and the artificial creation of a type III endoleak potentially allows sufficient blood flow through the spinal cord to be established. By opening the fenestration with the string modification, blood supply in the jeopardized spinal cord can be reestablished very quickly, in just a few minutes. Of course, the first step should certainly be cerebrospinal fluid drainage and mean arterial pres-

sure manipulations. Only if this treatment fails should reopening of the fenestration be performed. In contrast, the technique proposed by Reilly and Chuter⁴ is fundamental but quite demanding, requiring as it does considerable time to prepare the endovascular room and to induce a type Ib endoleak. During that time, the delayed paraplegia could become irreversible. After some time and after serial imaging to avoid and predict possible aneurysm enlargement as a result of the induced type III endoleak, a new stent graft might be placed for a safe endoleak resolution. To be specific, interval imaging studies have clearly established the ability of the spinal collateral network at the margin of the excluded aorta to enlarge with time. Thus gradually reduction of spinal cord perfusion through fenestration is a form of ischemic preconditioning that reduces the risk of SCI.⁴

Certainly, our idea has some limitations. First, we still do not know

whether creation of this endograft model is practicable. In light of available modern branched and fenestrated grafts and other high engineering achievements of today, however, it seems possible. Second, because we do not know the safety of the patch when dealing with high velocities of blood and because of the possibility of its rupture, this graft would at least at first be indicated only for patients at high risk for SCI. Third, in the meantime there is some reasonable risk of aneurysmal rupture because laminar blood flow in aneurysmal sac is replaced with turbulent forces, and a possibility of graft infection through any string placed still exists. We believe, however, that these expected complications would be deemed acceptable if alternative were permanent paraplegia. In conclusion, the possibility of designing this kind of endograft model would give hope to all patients undergoing endovascular treatment of thoracic aortic

aneurysms and would provide a big relief to every vascular surgeon and interventional radiologist who has seen this complication.

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References

1. Criado FJ, Clark NS, Barnatan MF. Stent graft repair in the aortic arch and descending thoracic aorta: a 4-year experience. *J Vasc Surg.* 2002;31: 1121-8.
2. Carroccio A, Marin ML, Ellozy S, Hollier LH. Pathophysiology of paraplegia following endovascular

thoracic aortic aneurysm. *J Card Surg.* 2003;11: 359-66.

3. Ilić N, Končar I, Dragaš M, Banzic I, Davidovic LB. Endoleak type II—deceitful predictor of delayed paraplegia. *Ann Thorac Surg.* In press 2010.
4. Reilly LM, Chuter TA. Reversal of fortune: induced endoleak to resolve neurological deficit after endovascular repair of thoracoabdominal aortic aneurysm. *J Endovasc Ther.* 2010;17:21-9.
5. Sullivan TM, Sundt TM 3rd. Complications of thoracic aortic endografts: spinal cord ischemia and stroke. *J Vasc Surg.* 2006;43(Suppl A): 85A-8.

doi:10.1016/j.jtcvs.2010.10.049