Mid-term results of the Lupiae technique in patients with De Bakey Type I acute aortic dissection†

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Abstract

OBJECTIVES: The late persistence of a patent and dilated false lumen into the thoracic aorta is associated to higher re-operation rates and to a worse prognosis after the surgical repair of De Bakey Type I acute aortic dissection (TIAAD). We present the mid-term results of a hybrid, two-stage technique for TIAAD aimed to reduce the risk of late expansion of the residual false lumen.

METHODS: From May 2005 to January 2011, 49 patients with TIAAD were treated with the Lupiae technique. During the emergency operation, a Vascutek Lupiae™, a multi-branched Dacron prosthesis, was implanted to replace the ascending aorta, the aortic arch and to reroute the origin of the epiaortic vessels. The debranching of the aortic arch creates a long and stable Dacron landing zone on the ascending aorta suitable for further endovascular interventions. Postoperatively, 34 patients with a patent or partially thrombosed false lumen > 22 mm or a diameter of the descending aorta > 46 mm underwent the implant endovascular stentgrafts into the descending aorta.

RESULTS: Three patients died after the first procedure. One patient died after the endovascular stage. No patient experienced paraplegia or stroke. The 6-year follow-up survival was 90 ± 4%. The obliteration of the false lumen was obtained in 94% of the patients.

CONCLUSIONS: In patients with TIAAD, the debranching of the aortic arch with the Lupiae technique can be safely performed. This technique creates a long and stable landing zone that can be easily used for the deployment of endovascular stentgrafts in case of distal false lumen expansion.

Keywords: Aortic dissection • Debranching • Hybrid • Endovascular

INTRODUCTION

The persistence of a patent false lumen inside the descending aorta seems to be a critical factor affecting the late survival and the complication rates after the surgical repair of De Bakey Type I acute aortic dissection (TIAAD) [1–5]. Very recent evidence shows that total arch replacement per se does not reduce the re-operation rates on the descending aorta compared with a more conservative approach [6]. This phenomenon may be due to the persistence of intimal tears into the distal aorta and the ‘frozen elephant trunk’ (FET) technique has been proposed in patients with TIAAD as an option to exclude in one step the residual false lumen [7]. Nevertheless, this procedure seems to be associated to a significant risk of paraplegia and endoleaks requiring further endovascular interventions [8]. We present the mid-term results of a hybrid, two-step aortic debranching procedure for patients with TIAAD, aiming to reroute proximally the origin of the epiaortic vessels and to create a long and stable landing zone in Criado Zone 0 [9] suitable for endovascular stentgrafts deployment in case of distal false lumen expansion.

MATERIAL AND METHODS

We report the retrospective data of 49 patients who presented with TIAAD from May 2005 to January 2011 and underwent emergency aortic repair with the Lupiae technique by a single surgeon (G.E.) at two institutions. From May 2005 to March 2006, the procedure was performed on four patients using a custom-made prosthesis identical to the Lupiae™ graft (Terumo Vascutek, Renfrewshire, Scotland) that was commercially available from March 2006. Patients with De Bakey Type II and III dissections, with chronic or iatrogenic dissections were excluded from the present study. All the patients underwent a preoperative computed tomography (CT) scan to confirm the diagnosis and verify the extent of the aortic dissection.

The Gelweave Lupiae™ graft shown in Fig. 1 is constructed with a main cylindrical Dacron graft sized 26–32 mm and three branches of different sizes (10, 10 and 8 mm) coming off from a
short 16 mm bovine-like trunk on the right side of the main graft and another 10 mm branch originating from the left side. This prosthesis also presents a radiopaque marker immediately after the origin of the bovine-like trunk, which is necessary to correctly deploy the endovascular stentgrafts during the second stage. The name ‘Lupiae’ derives from the Roman name of Lecce, the Italian city where this procedure was initially performed in 2005.

The first step of the Lupiae technique consisted of the replacement of the dissected ascending aorta and the arch with the Lupiae™ graft, the debranching of the aortic arch and the reimplant of the innominate trunk, the left carotid artery and the left subclavian artery (LSA) on the branches of the Lupiae™ graft. Once the patients were in stable condition and had been discharged from intensive care, they underwent a CT scan. If they presented a patent or a partially thrombosed false lumen > 22 mm or a patent/partially thrombosed false lumen < 22 mm but an overall diameter of the descending aorta > 46 mm, they underwent the second step of the procedure, the deployment of endovascular stentgrafts landing proximally on the Lupiae™ graft at the level of the Criado ‘landing zone 0’ and distally on the descending aorta just above the coeliac trunk. Fig. 2 shows the surgical (Fig. 2A) and the endovascular step (Fig. 2B) of the Lupiae technique.

**PROCEDURE DETAILS**

**The surgical stage**

Total intravenous anaesthesia was performed of all the patients. Left and right radial arteries were cannulated for continuous blood pressure monitoring. Transoesophageal echocardiographic monitoring was used to confirm the diagnosis of aortic dissection and to evaluate the anatomy of the aortic root. Cerebral oxygenation was evaluated through near-infrared spectroscopy monitoring (INVOS cerebral oxymeter; Somanetics Corporation, Troy, MI, USA). A full sternotomy was performed with a small left laterocervical incision for better exposure of the epiaortic vessels, particularly for the LSA. If the haemodynamic parameters were stable, the epiaortic vessels were preferably isolated before opening the pericardium. The most common arterial cannulation site was the innominate trunk. After a full dose of heparin, an 8-mm Dacron graft was anastomosed end-to-side to the innominate trunk and it was connected to the main arterial line. In nine patients, the innominate trunk was dissected at the CT scan and the right subclavian artery was used as arterial cannulation site with the interposition of an 8-mm Dacron graft. In two patients, where the aortic dissection was extensively involving the innominate trunk and its branches, the perfusion of the true lumen was achieved by cannulating the apex of the LV and crossing the aortic valve under transesophageal echocardiogram (TOE) guidance. A Y-connection was positioned on the main arterial line to allow antegrade distal perfusion while performing the anastomosis of the epiaortic vessels. Subsequently, the LSA was clamped at its origin, detached from the aortic arch and anastomosed end-to-end with an 8-mm Dacron graft that was connected to a second perfusion line. In 10 cases, the isolation and the selective perfusion of the LSA could not be achieved since the artery was too deep inside the chest and lateral. These 10 patients underwent a carotido-subclavian bypass before the endovascular step through a left supraclavicular incision.

Once the pericardium was opened, a two-stage venous cannula was positioned inside the right atrium and cooling of the cardiopulmonary bypass (CPB) commences with
temperature set at 28°C. A separate pump was set to maintain a 10 ml/kg/min flow into the LSA. A vent was positioned into the right superior pulmonary vein. After cross-clamping the aorta, the myocardial protection was achieved through the infusion of intermittent cold blood cardioplegia into the coronary ostia. The dissected ascending aorta was removed and if necessary an aortic valve/root repair or replacement was performed. The Lupiap™ graft was then anastomosed to the sino-tubular junction originating the bovine-like trunk upward and parallel to the superior vena cava and the fourth branch towards the pulmonary artery. The lateral orientation of the side branches was also adopted to avoid the graft compression after chest closure. The innominate trunk was then cross-clamped at its origin and the antegrade arterial flow to the brain was reduced to 10 ml/kg/min maintaining a perfusion pressure of 40–50 mmHg measured at the level of the right radial artery. In distal circulatory arrest with antegrade unilateral cerebral perfusion, the cross-clamp was removed and the distal anastomosis was performed on the aorta between the origin of the left common carotid artery (LCCA) and the LSA. Once this anastomosis was completed, the systemic distal perfusion was resumed connecting the Y arterial line to the fourth branch of the Lupiap™ graft, and the rewarming was started.

The sequential connection of the LCCA and innominate trunk were performed, respectively, with the 8 and 10 mm branches originating from the bovine-like trunk. The CPB was discontinued and the branch used for the arterial perfusion was anastomosed to the Dacron graft connected to the LSA, or tied if the LSA could not be initially isolated.

### The endovascular procedure

As soon as the patients were discharged from the Intensive Care Unit, they underwent a CT scan. If the false lumen was patent or partially thrombosed and its diameter was >22 mm, or if the false lumen was patent or partially thrombosed and transverse diameter of the descending aorta was >46 mm, the patients were scheduled for the endovascular step. If these criteria were not met, the patients were discharged and scheduled for repeated CT scans at 1 and 6 months initially and then once a year. The endovascular procedures were performed in the cath-laboratory under general anaesthesia with continuous TOE monitoring. In case the LSA could not be isolated and connected to the Lupiap™ graft at the time of the first procedure, a carotido-subclavian bypass was performed immediately before the endovascular procedure through a left supraclavicular approach. The right femoral artery was most commonly exposed to the Lupiap™ graft, and the rewarming was started. As soon as the patients were discharged from the Intensive Care Unit, they underwent a CT scan. If the false lumen was patent or partially thrombosed and transverse diameter of the descending aorta was >46 mm, the patients were scheduled for the endovascular step. If these criteria were not met, the patients were discharged and scheduled for repeated CT scans at 1 and 6 months initially and then once a year. The endovascular procedures were performed in the cath-laboratory under general anaesthesia with continuous TOE monitoring. In case the LSA could not be isolated and connected to the Lupiap™ graft at the time of the first procedure, a carotido-subclavian bypass was performed immediately before the endovascular procedure through a left supraclavicular approach. The right femoral artery was most commonly exposed to the Lupiap™ graft, and the rewarming was started.

### Follow-up

Follow-up was 100% complete and ranged from 6 months to 6 years (median 2.5 years). All the patients underwent a CT scan after each step, 6 months after the completion of the endovascular step, and then once a year at the time of the outpatient appointment.

### Statistical analysis

Categorical variables were presented as absolute numbers and percentages. Continuous variables were presented as mean ± standard deviation. The Kaplan and Meier product limit method was used to calculate the survival. The statistical software used was Stat-View 5.0 statistical software package (SAS Institute Inc, Cary, NC, USA).

### RESULTS

Preoperative and intraoperative data are depicted in Table 1. Only one of the 49 operated patients presented the features of Marfan syndrome. One patient had a previous aortic valve replacement. The intimal tear identified by direct intraoperative observation was found in the ascending aorta in seven patients (14%), in the aortic arch in 29 patients (59%), whereas in 13 (26%) patients, it could not be identified in any of these segments and therefore it was probably further distal in the descending aorta.

All the patients with mild or moderate aortic regurgitation (AR) underwent aortic valve resuspension. Six patients presented severe AR and a dilated aortic root; three of them underwent root replacement with a biological valved conduit and the remaining three underwent valve sparing root replacement according to the David technique. Only 8 patients (five with severe AR and three with moderate AR) with a dilatation of non-

![Table 1: Preoperative and intraoperative characteristics of patients undergoing Lupia technique for TIAAD](image-url)
coronary sinus underwent aortic valve resuspension plus the replacement of non-coronary sinus.

Three patients died after the surgical step (6%). One patient died of uncontrollable bleeding from the rupture of the descending aorta in theatre, another of right ventricular failure despite having implanted an right ventricular assist device and the last of multi-organ failure after mediastinitis. No patient experienced permanent stroke or paraplegia after the surgical step but three patients had transient ischaemic attack (6%). One patient needed re-exploration for bleeding (2%). Two patients experienced renal failure requiring temporary dialysis. One patient underwent tracheostomy for respiratory failure. One patient had mediastinitis. The postoperative length of stay was 18.1 ± 10.2 days.

Of 46 patients who survived Lupiae technique for De Bakey Type I aortic dissection, 34 (69%) presented a patent or partially thrombosed false lumen >22 mm or a patent/partially thrombosed false lumen <22 mm with a descending aorta >46 mm at the CT scan and underwent the endovascular step. The mean distance between the radiopaque marker identifying the position of the bovine-like trunk and the distal anastomosis was 3.1 ± 0.5 cm. In all the 10 patients who underwent carotido-subclavian bypass, the procedure was uncomplicated.

Twelve patients underwent the endovascular step within the same admission of the emergency surgical procedure, whereas nine had it done at 1 month from the discharge and 13 patients later than 1 month. The average waiting period for the endovascular step was 3.1 ± 2.2 months. No patient died during the waiting period.

After the endovascular step, one patient died of bowel ischaemia: this patient had preoperatively ongoing signs of abdominal malperfusion and, despite undergoing urgent thoracic endovascular aortic repair (TEVAR) after the surgical step to re-expand the true lumen, the patient developed bowel necrosis. No patient presented type I to IV endoleaks at the end of the procedure. No patient experienced stroke or paraplegia after stentgraft implant. At 6 months’ CT scan, no patient presented any type of endoleak and the complete obliteration of the false lumen into the descending aorta was achieved in 31 out of 33 patients (94%). Of the two remaining patients, one had a partial thrombosis of the false lumen into the abdominal aorta with stable diameters through all the follow-up (Fig. 3A), whereas the second one was a Marfan patient who presented 6 months after the endovascular step with a patent and expanding false lumen into the abdominal aorta that required the replacement of the abdominal aorta with a Lupiae™ graft, the debranching of visceral vessels, and the implant of more endovascular stentgrafts between the thoracic stentgrafts and the abdominal Lupiae™ graft (Fig. 3B). One patient with a preoperative history of chronic obstructive pulmonary disease died 5 months after the procedure in his district hospital for respiratory failure due to recurrent chest infections. Six-year survival was 90 ± 4% including the in-hospital mortality (Fig. 4) and 100% considering only the follow-up after the two steps. Among the 12 patients who did not undergo the endovascular step since the false lumen was thrombosed, the diameters of the descending aorta have remained stable at CT scans and no further endovascular or surgical procedure was needed.

DISCUSSION

The reoperation rates on the downstream aorta in patients undergoing conventional surgery for TIAAD remains high ranging between 16% and 26% at 10 years [10, 11]. The late persistence of a patent false lumen seems to be a critical factor affecting the long-term outcome after emergency repair of TIAAD [1–5]. In fact, Song et al. [5] evidenced that the partial thrombosis of the distal false lumen in patients operated for acute aortic dissections is associated to faster growth rates of the descending aorta, to higher re-operation rates and to a worse 10-year survival. These results are consistent with another series [4] showing 189 patients who underwent surgical repair of Type A aortic dissection and that the patency of the residual false lumen together with Marfan syndrome and a diameter of the descending aorta >45 mm are significant risk factors for late mortality and re-operation. Song et al. [2] evidenced that in patients undergoing surgical repair of aortic dissection, a diameter of the
false lumen >22 mm in the descending aorta predicts late aneurysm development with a sensitivity of 100% and a specificity of 76% and is associated with a worse long-term survival.

The factors influencing the thrombosis of the residual false lumen are still not clear. In our series, the identification and the resection of the intimal tear during the surgical procedure were not effective in achieving the thrombosis of the false lumen, as we identified and resected the tear in 73% of the patients, but still 69% of them presented postoperatively a patent and a dilated false lumen. This phenomenon may be due to the presence of multiple intimal tears in the descending aorta.

It has been reported that the false lumen in the downstream aorta remains patent in up to 70% of patients undergoing ascending aorta replacement and up to 30% in patients undergoing aortic arch replacement [12, 13]. On the other hand, a recent report by Kim et al. [6] shows that the extension of the aortic resection to the arch seems not to reduce the distal re-operations rates, compared with hemiarch replacement.

Given the prognostic importance of a patent and a dilated residual false lumen after TIAAD repair and the limited effectiveness of total arch replacement per se in achieving false lumen thrombosis, several strategies have been adopted to address this issue.

Thanks to the improvements of TEVAR techniques, the classic ‘elephant trunk’ technique developed by Borst and colleagues in 1983 has been transformed into a hybrid procedure with good results in chronic aneurysms as in aortic dissection as reported in few series [14–16].

Nevertheless, several technical problems could arise from stenting a ‘free-floating’ elephant trunk. In fact, the elephant trunk could be too short causing epiaortic vessels overstenting or too long facilitating the formation of clots that may embolize causing spinal cord vascular injuries. Moreover, the mobility of an elephant trunk could make the endovascular stent deployment difficult and an excessive curvature at the level of the anastomotic site could facilitate Type I endoleaks [17, 18].

The FET technique could be a valid option to address the issue of distal false lumen patency. Although this hybrid procedure seems to be effective in achieving the thrombosis of the false lumen in chronic aortic dissections with a success rate of up to 82% in Di Eusanio series [19], the incidence of spinal cord injuries ranging between 3% and 22% and stroke between 3% and 16% according to a recent review on FET [8] could represent a significant problem of this procedure. Moreover, given the reported percentage of endoleaks between 2% and 18% [8] and the need for endovascular interventions of up to 22% [19], we agree with us and colleagues that the FET should not be really considered a one-step procedure [8].

Aortic arch debranching is becoming a popular technique to treat patients with aortic aneurysms as suggested by several published series [8] reporting satisfactory results in terms of mortality and complications rates. Nevertheless, the experience with this technique in patients with TIAAD is still limited. Our preliminary results with this technique in 24 patients operated between 2006 and 2008 for TIAAD were encouraging, showing a complete thrombosis in 96% of the patients [20]. The present series of patients undergoing the Lupiae procedure is not only the largest population of patients undergone aortic arch debranching for TIAAD but also the one with the longest follow-up. Recently, Glauber presented a very similar aortic arch debranching technique [21] for 23 patients with TIAAD. He reported a distal circulatory arrest time of 25 ± 7 min, which is consistent with our distal circulatory arrest time of 21.2 ± 3.1 min confirming the reproducibility and the ease of execution of the surgical step and he also reported excellent results in terms of mortality and neurological complications. There are three main differences between the Lupiae technique and the Glauber technique for patients with TIAAD: the first is the perfusion of the LSA during the surgical step. The perfusion of the LSA could play a role in brain, spine and visceral organ protection during the distal circulatory arrest. Recently, Miyamoto demonstrated that the perfusion through the LSA during circulatory arrest significantly increases the collateral blood flow into the descending aorta and the blood flow through the stomach and the liver [22]. The second difference is on the systematic reimplant of the LSA. We are aware that the reimplant of the LSA during the first step could be sometimes cumbersome and to improve the exposure of this aortic branch, we routinely extend the sternotomy with a small left laterocervical incision. Despite this approach, the LSA could not be easily reached in 10 patients who underwent carotido-subclavian bypass before the endovascular step. We believe that the reimplant rather than the coverage of the LSA with the endovascular stentgraft could significantly impact on the complication rates of the second step of the procedure. This view is in line with the current Society for Vascular Surgery guidelines, reporting that the coverage of LSA during TEVAR procedures is associated to an increased risk of paraplegia, stroke, arm ischaemia and Type II endoleaks, and recommending LSA reimplant in all the patients undergoing elective TEVAR with the involvement of the LSA [23]. The third difference is on the indication for the endovascular step. Glauber reserves this step to patients with very large dissected thoraco-abdominal aneurysms (>6 cm) and to patients with aortic grow rates >1 cm/year. The indications to the implant of endovascular stentgrafts in residual dissections after TIAAD repair are still controversial and at the moment, no official guideline has been released on this topic. Nevertheless, growing evidence from retrospective series shows the long-term prognostic impact of a patent or a partially thrombosed false lumen after TIAAD repair [1–5, 10, 11] and our personal opinion is that the chances to treat effectively a dissected thoraco-abdominal aneurysms >60 mm with an endovascular approach could be much less than when the descending aorta is >45 mm, as the excessive diameter of the distal landing zone, the limited maximum diameters of the stentgrafts commercially available and the possibility of kinking on the descending aorta could preclude the complete sealing of the endovascular stentgrafts and require further surgical intervention.

It is also important to compare the Lupiae technique with the FET. We appreciate that FET is a very attractive option to treat extensively patients with aortic dissection in one step. One of the largest series of patients undergoing FET for TIAAD has been recently published by Uchida [7] reporting the experience on 80 patients over 13 years. In his series, the distal circulatory arrest with selective cerebral perfusion was 36 min at 28°C, the mortality 3%, the incidence of stroke of 3% and the percentage of patients needing further procedures on the distal aorta was 8%. These data are consistent with the ones presented by Sun [24] on 291 patients undergoing FET for acute and chronic Type A aortic dissection (spinal cord injury 2%, stroke 2%) reporting a selective cerebral perfusion time of 24 min in deep hypothermia (18°C). Another series by Di Eusanio on 49 patients with chronic aortic dissections, where 82% of patients had previous cardiac surgery for acute dissection report a distal circulatory arrest of 72 ± 18 min at 26°C, a mortality of 10%, an incidence of permanent neurological complications of 10% (6% coma, 4% paraplegia),
and 22% of patients required further endovascular procedures because of persistent false lumen patency or stentgraft collapse [19]. These data suggest that a longer distal circulatory arrest time due to a more complex distal procedure, especially in an emergency setting and without using deep hypothermia may lead to a higher incidence of neurological complications.

Deploying a stentgraft into an acutely dissected aorta may carry a higher risk of aortic disruption, peripheral embolization, malperfusion and paraplegia [25]. We also believe that in acute dissections addressing retrogradely the issue of the descending aorta with the FET technique, without knowing if the resection of the intimal tear will effectively exclude the false lumen, may lead to treat patients who would not benefit from the deployment of a stentgraft into the descending aorta. In our series, 12 patients (26%) who presented a thrombosed false lumen after the first step and who did not require any further treatment during the follow-up, would have been treated in excess following the FET strategy.

The main advantage of the Lupiae technique is to create a long, stable and durable landing zone in Criado Zone 0. Rerouting the origin of the epiaortic vessels closer to the sinotubular junction allowed us to have a distance between the bovine-like trunk and the distal anastomosis, normally positioned for the Lupiae technique between the origin of LCCA and the LSA, never shorter than 2.5 cm. The length and the position of the proximal landing zone, together with the systematic reimplant of the LSA and the choice to address the problem of the patent/partially thrombosed false lumen when the descending aorta is not already extremely dilated, could probably explain our excellent results in terms of endoleaks.

The main limitations of the study are the retrospective design, the lack of a randomized control group and the small sample size. Few observational studies on the long-term destiny of a patent false lumen after TIAAD repair confirm and support our endovascular strategy [1–5, 10, 11] but more solid evidence could only come from randomized trials.

In conclusion, we report our positive experience treating with the Lupiae technique one of the most challenging disease in cardiac surgery. The debranching of the aortic arch in the acute setting of aortic dissection has proven to be a safe technique allowing for an easier and staged endovascular procedure on the downstream aorta if needed.

**Conflict of interest:** none declared.

**REFERENCES**


**APPENDIX. CONFERENCE DISCUSSION**

Dr J. Bachet (Abu Dhabi, United Arab Emirates): This report, for me, is rather intriguing and raises many points for interrogation and some scepticism. The main point of surprise rests on your vision of acute type A dissection and the concept of its emergency treatment. Throughout your manuscript and your presentation, you insist on the fact that the Lupiae technique allows the provision of a good landing zone for further endografting of a possibly patent and dilated false channel. Is this really the problem of acute dissection treatment?
Patients with acute type A dissection present with highly variable and different clinical and anatomical conditions. Some are perfectly stable with little anatomical or physiological damage. With such patients, there is time for the surgical team to plan and perform a good procedure, allowing the treatment of the immediate problem and also the prevention of future complications, as you did. But, in other patients, the only problem is their immediate survival. Those patients need emergency surgical techniques that have little to do with the mid-term or long-term future. Nothing of the kind is addressed in your study, and it seems that all your patients were in stable condition with no vital complications, so that the only problem was to think of the future of the false lumen.

Another issue that I always found quite worrisome in my experience of acute dissection was the technical difficulties in performing tight and safe anastomoses on those dissected and very fragile tissues. You do not address this point and you do not indicate how the haemostasis was obtained in the multiple anastomoses required by your technique.

But turning back to the concept of your operation, you seem to be quite concerned by the patency of the distal false lumen. Is it really so bad? Except for the well-known and indisputable problem of Marfan syndrome, a large number of patients with a residual patent false lumen have a good long-term survival. For instance, in a study that we published about one decade ago and in which all patients had been operated on without any debranching or hybrid technique, there was a residual patent false lumen in about 75% of them, but the survival rates were 50% and 35% at 12 and 20 years. In this regard, to decide whether the patients need a second-stage TEVAR or not, you have set a strict cutting edge at 22 mm of dilatation of the false lumen and 46 mm for the descending aorta based only on a recent report by Song. Is this realistic, since perhaps a larger experience would evidence very different outcomes and long-term data?

Finally, you state that the Lupiae technique is less prone to induce spinal cord injury than the one-stage FET technique. How do you explain this, the extension of the stent-grafting being exactly the same in your technique and in the other one?

So to conclude I would like to ask you two questions: Firstly, do you really believe that the fate of the false lumen is the major problem in the immediate outcome of the patients suffering from acute type A dissection? Secondly, don’t you think that a systematic complicated procedure as the one you propose might be excessive in many cases that could benefit from a much simpler operation? In other words, don’t you think that the surgical treatment of acute dissection should better be customized to the patient’s lesions?

Dr Cappabianca: First of all, I would like to clarify the indication to perform this operation; as you saw in the paper, these cases are not consecutive, so it’s not a technique for all-comers. The indication to perform the Lupiae technique is an extensive DeBakey type 1 dissection which involves all of the aorta down to the iliac bifurcation. If you have a Type 1 dissection that terminates at the level of the LSA, this technique is pointless. I agree that in the case of patients that are moribund or with severe neurological damage, probably this type of procedure is not indicated. So the Lupiae procedure needs to be done in selected patients where you can think about the future of the patient, when you have a reasonable chance to take them out of the theatre and think of their future. With this perspective there is a very good indication to perform something that facilitates the next procedure and makes the chances of TEVAR failure less likely. We have seen during this meeting, the possible complications of stent-graft implantation on very short landing zones.

Regarding the second question about the bleeding due to many suture lines, I would like to point out that we have done this operation without using deep hypothermic circulatory arrest and that the extension of a suture line, let’s say, in the traditional way the arch is done, is probably more extensive than doing the single anastomosis that can be very easily mobilized, once you finish the operation, to add the extra stitches. So if there is less coagulopathy, because you are in mild hypothermia and you can check the anastomosis more easily, probably the bleeding can be managed.

The third thing about the indication to implant the endovascular stent, there is a very recent paper by Dr Glauber presenting a very similar technique for the proximal part, but with a very different indication on the implant of the endovascular stent-graft which is when the downstream aorta is more than 60 mm. We believe that at that stage the chances of having a type 1 endoleak distally with a very large aneurysm will be higher. I agree with you that we haven’t got prospective data on the prognostic impact of a patent false lumen.

Dr A. Moritz (Frankfurt, Germany): May I summarize that it’s open to discussion in which patients this more liberal technique would be beneficial, and we have to finalize this discussion later on.