those patients with associated cardiac and respiratory diseases. To minimize these factors contributing to extent of operation, Type II operation was adopted as the preferable form of treatment. Despite the fact that shunts were not employed, the longer periods of temporary organ ischemia were well tolerated. Eliminating the major parts of the dissection required for Type I operation by exposure and reconstruction within the aneurysm and reducing blood loss both by this technique and by inclusion of grafts and arterial reconstruction tremendously reduced the magnitude of operation. Moreover, eliminating the principle of insertion of the aortic graft first around the aneurysm as a shunt to be used subsequently as the permanent graft made it possible to individualize exposure in these cases. For example, Type II and III operations are confined to the abdomen when the aneurysm does not extend above the diaphragm whereas thoraco-abdominal exposure was routinely required when employing Type I operation.

A theoretical disadvantage to Type II operation is the fact that the island of aneurysmal wall containing the origins of the right renal, superior mesenteric, and celiac arteries sutured to the side of the aortic graft also contains a small area of aneurysmal wall between the orifices of those vessels. Theoretically, this weakened area like aneurysmal wall is subject to later rupture. This fortunately has not occurred in this series of 12 cases with followup for 1 to 5 years. Nonetheless, these considerations have led to the application of the Type III operation in two cases during the past year. In view of limited experience, the applicability of this technique is not evident; however, it will be considered the procedure of choice if its application in future cases is as easy and as successful as it has been to date.

Addendum

Since this paper was submitted, 5 additional patients have been treated for aneurysms which involved the celiac, superior mesenteric, and renal arteries by procedures combining techniques described as Type II and III operation. The aneurysm involved both thoracic and abdominal aorta in 4 and was confined to the abdominal aorta in 1 patient. Death occurred from cardiac failure in 1 patient with chronic heart and renal disease in whom operation was performed for rupture of large thoraco-abdominal aortic aneurysm.

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Discussion

President Hardy: I would like to ask whether or not one should use total body heparinization during the period in which the perfusion of the viscera has been temporarily discontinued.

Dr. James R. Jude (Miami): I rise because as I listened to this this paper I thought about the few patients I have had with this extensive problem, and which generally result either in or near a disaster. The blood loss always seemed to be at least 6000 cc for us. If you take just those aneurysms isolated to the descending thoracic aorta and have to replace the entire descending thoracic aorta, which I have had to do a number of times, there always seem to be some, at least, transitory lower extremity weakness. Fortunately, we have never had any complete paraplegia persist.

I'm interested to hear that you have had only one case of paraplegia, because if you do your procedure where you have to replace both the thoracic and abdominal aorta, I would think that this would be even more likely. You did mention, however, that you reanastomosed the lumbar arteries, at least in one case, and this may be important if anatomically feasible.

I'd like to ask two questions: First, how often do you see at least a temporary paresis from your thoracoabdominal aortic resection?

And the second question is about the indications for operating on this type of patient. I see a lot of patints with a lower thoraco-abdominal fusiform aneurysm, beginning in the lower thoracic aorta and extending down to just above the renal arteries, who are quite old; i.e., over 65.

We follow these because I believe the mortality rate there would be horrendous and I tend to think that the results, at least in our hands, are better in following them than if we try to do such a massive procedure.

Dr. E. Stanley Crawford (Closing discussion): Heparin was not used in these cases to avoid the possibility of increasing blood loss.

Paraplegia is likely to occur after operation in approximately 5% of cases with thoraco-abdominal aortic aneurysms. This incidence can be reduced by maintaining normal blood pressure and sparing and reattaching intercostal and lumbar arteries.

I feel that aggressive treatment, i.e., excision and graft replacement, is indicated in these cases. Despite the fact that the majority of the cases in this series were in the older age group and having had rupture, leakage, or pain from expansion and erosion, the majority survived and were restored to good health.