Large Area of the False Lumen Favors Secondary Dilatation of the Aorta After Acute Type A Aortic Dissection

Franz F. Immer, MD; Eva Krähenbühl, MD; Urs Hagen, MD; Mario Stalder, MD; Pascal A. Berdat, MD; Friedrich S. Eckstein, MD; Jürg Schmidli, MD; Thierry P. Carrel, MD

Background—Since 1994 patients with acute aortic dissection type A (AADA) are followed-up in our outpatient clinic. Early diagnosis of secondary dilatation of the diseased aorta is crucial to reduce late mortality in these patients. Aim of the present study is to assess the impact of a large volume in the false lumen of the diseased downstream aorta on secondary dilatation.

Methods and Results—134 patients of 264 patients who underwent surgery for AADA (between January 1994 and June 2003) are followed-up at our outpatient clinic since 1994. 84 patients (62.7%) fulfilled the inclusion criteria. Areas of the true and the false lumens of the aorta were analyzed and a logistic regression was calculated at 5 levels of the aorta for each patient. Patients were divided in 3 groups: group 1 included 34 patients (40.5%) without progression, group 2 had 34 patients (40.5%) with slight progression, and group 3 had 16 patients (19.0%) with important progression, requiring surgery in all patients. In 87.5% of the patients the area of the original lumen was <0% in group 3, compared with 11.8% in group 2 and 8.8% in group 1 in relation to the total area of the aorta 6 months after surgery (P<0.001).

Conclusion—A large false lumen, with an area of the true lumen <30% 6 months after surgery, is the strongest predictor for secondary dilatation of the diseased downstream aorta. (Circulation. 2005;112[suppl I]:I-249–I-252.)

Key Words: aorta ■ dissection ■ follow-up studies ■ risk factors ■ type A
lumens were calculated at the time of diagnosis of AADA and 6, 12, and 18 months after surgery. A quotient reflecting the area of the true lumen in relation to the total area of the cross section of the aorta at the different levels was calculated.

**Statistical Analysis**

Data are presented as absolute values or mean values ± their first standard deviation. A Mann–Whitney U test and χ² test were used for comparison between groups of continuous and nominal variables, respectively. Linear regression for the relationship between modification of the diameter of the aortic arch and/or descending aorta over time was analyzed. Cutoff values for repartition of the 3 groups were defined to improve the predictive value. P <0.05 was considered significant. Data were analyzed using the StatView 4.1 statistical package (Abacus Concepts, Berkely, Calif).

### Results

84 patients fulfilled the inclusion criteria. Pre- and perioperative characteristics of these patients are summarized in the Table. Follow-up was similar in all 3 groups, with an average follow-up of 55 ± 13 months. 584 CT scans or MRI were analyzed. 86% of the dilatations were found at the level of the aortic arch and/or thoracic descending aorta. 20% of the dilatations were found at level 1 (aortic arch), 46% at level 2, 20% at level 3 (thoracic descending aorta), and at levels 4 and 5 only 7% at each level. The relation between the areas of the true and the false lumens at the time of diagnosis and 6 months after surgery is displayed.
in Figure 1. A significant difference was found at the time of diagnosis between groups 1 and 2, compared to group 3, which was even more pronounced 6 months after surgery, with a quotient of $0.9 \pm 0.5$ in group 1, $0.9 \pm 0.6$ in group 2, and $0.3 \pm 0.1$ in group 3. A quotient $<0.3$ was found in $87.5\%$ of the patients of group 3 at the follow-up, compared to $8.8\%$ in group 2 and $11.8\%$ in group 1 ($P<0.05$). Follow-up was similar in all groups.

The calculated odds ratio for a quotient $<0.3$ was $4.3$ at the time of diagnosis and $7.4$ at the follow-up 6 months after surgery. The maximal diameter of the aorta at the time of diagnosis of AADA was $3.4 \pm 0.8$ cm in group 1, $3.3 \pm 0.6$ cm in group 2, and $3.2 \pm 0.8$ cm in group 3 ($P=NS$) (Figure 2).

**Discussion**

A patent false lumen has been shown to be a risk factor for secondary dilatation in patients with chronic type B aortic dissection. However, this observation has been discussed controversial. Dilatations of the diseased downstream aorta have been found in $83.9\%$ of patients with chronic type B aortic dissection in an average follow-up period of 49 months. In the same observation period, dilatations were found in $59.5\%$ of our patients, mainly at the level of the aortic arch and the thoracic descending aorta in patients with De Bakey type I dissection.

Because no significant difference was found of the aortic diameter at the time of diagnosis, one may assume that this aspect, which has been shown to be a risk factor for secondary dilatation, is not primary responsible for the dilatation observed in the first 6 months after surgery in group 3. However, patients with dilatation of the aortic arch and/or the downstream aorta at the time of diagnosis of AADA have been excluded from the present study, because they required surgery in the early follow-up. Of 14 patients being excluded, because of primary dilatation of the aorta, $6$ ($42.9\%$) had Marfan syndrome, which is a well-known risk factor for aneurysmatic dilatation of the aorta.

Analyses of the area revealed that expansion of the aorta, observed 6 months after surgery in group 3, is mainly caused by a dilatation of the false lumen, because the volume of the true lumen remains quite stable over time. This is probably related to the instability of the dissected aortic wall, mainly at the site of the false lumen, where the quality of the aortic wall is impaired. The increase of the area of the false lumen leads to the observed reduction of the true lumen ($Q<0.3$) in $87.5\%$ of our patients from group 3, 6 months after surgery (odds ratio, $7.4$).

Additionally, dilatation is favored because of the blood flow in the patent false lumen, increasing wall tension. Only a few invasive blood pressure measurements are available in these patients up to now, revealing that in patients with a large area of the false lumen, blood pressure is higher in the false lumen, compared with the values in the true lumen. However, these are only preliminary data in 8 patients, not allowing us to draw conclusions based on these observations.

We are aware that group 3 is only a small group, including 16 patients with an important progression of the dissected aortic arch and/or the downstream aorta after surgery for AADA. However, despite the small number of patients in group 3, the results are highly significant compared with the data from patients of groups 1 and 2, which counterbalances the limitation of the present study.

We conclude that a large area of the patent false lumen ($>70\%$ of the total area of the total trans-sectional diameter of the aorta) is the strongest predictor for secondary dilatation in the diseased downstream aorta. A follow-up should be performed in all patients after surgery for AADA at least up to 24 months after surgery to prevent acute late complications of the downstream aorta.

**References**


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