Mid- and Long-Term Outcomes for Surgical Correction of Subaortic Stenosis: A 27-Year Experience

Objective:
The purpose of this study was to review the mid- and long-term outcomes following surgical management of patients with subaortic stenosis (SAS) and to define the risk factors for its recurrence.

Methods:
120 patients operated for SAS (April 1990- August 2016) were reviewed retrospectively. Patients with major associations such as hypoplastic aortic arch, interrupted aortic arch, severe valvular aortic stenosis, and hypertrophic obstructive cardiomyopathy were excluded. Time to reintervention and predictors of recurrence were assessed using Kaplan-Meier analysis, Log-Rank test and uni/multi variable Cox regression. The statistical significance was set at p<0.05.

Results:
The median age at surgery was 4.7 years [Interquartile range (IQR) 2.9, 8.1] with a median peak gradient across the left ventricular outflow tract (LVOT) of 52.5 mmHg (IQR 40, 70). Fibrous tissue excision (n=120) with septal myectomy (93%; n=112) was the procedure of choice at primary operation. Median follow-up was 13 years (IQR 7, 18) with freedom from reintervention at 1, 3, 5 and 10 years being 99% [95% confidence interval (CI)= 94%, 99%], 94% (CI= 87%, 97%), 93% (CI= 86%, 96%), and 90% (CI= 82%, 94%), respectively. Recurrence occurred in 18% (n=20) with reinterventions performed in 15 of them, involving re-resection of the fibrous ridge ± septal myectomy (n=8) or a Konno procedure + aortic valve replacement (n=3) or a modified Konno procedure (n=6) or a Ross-Konno procedure (n=4). Multivariate analysis revealed pre-operative peak LVOT gradient [Hazard Risk (HR)= 1.04, CI=1.01,1.08, p=0.016], preoperative aortic annulus z-score (HR= 0.73, CI= 0.53, 0.99, p=0.043) and presence of bicuspid aortic valve (HR= 7.6, CI= 2.28, 25.26, p= <0.001) as predictors of reintervention. Length of follow-up predicted occurrence of mild/moderate aortic regurgitation on univariate analysis (Odds ratio= 1.10, CI=1.03, 1.18, p=0.004), being present in 49% (n=55) of patients at latest follow-up.

Conclusions:
Subaortic stenosis remains a progressive disorder with a significant recurrence rate demanding more radical reoperations for subsequent development of multilevel LVOT obstruction involving aortic valve and the annulus. Preoperative peak LVOT gradient, preoperative smaller aortic annulus size and presence of bicuspid aortic valve predict reintervention. Aortic regurgitation is a major consequence of SAS, but its severity usually remains low and increases with length of follow-up period.

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Outcomes for Surgical Correction of Subaortic Stenosis

**PATIENTS**

120 patients, median age 4.7 years

with Subaortic stenosis, median peak gradient 52.5 mm Hg

Surgical repair - primary/ reoperation

**RESULTS**

Median follow-up 13 years
Recurrence rate of SAS 18%

Freedom from reintervention

<table>
<thead>
<tr>
<th>Time (yrs)</th>
<th>%</th>
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<tbody>
<tr>
<td>1</td>
<td>99%</td>
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<tr>
<td>3</td>
<td>94%</td>
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<tr>
<td>5</td>
<td>93%</td>
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<tr>
<td>10</td>
<td>90%</td>
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Predictors of reintervention

- Preoperative peak LVOT gradient
  HR = 1.04, CI = 1.01, 1.08, p = 0.016

- Preoperative aortic annulus z-score
  HR = 0.73, CI = 0.53, 0.99, p = 0.043

- Bicuspid aortic valve
  HR = 7.6, CI = 2.28, 25.26, p = <0.001

Length of follow-up predicts severity of AR
OR = 1.10, CI = 1.03, 1.18, p = 0.004

**CONCLUSIONS**

SAS is a recurrent disease requiring radical reoperation for subsequent multilevel LVOT obstruction involving aortic valve. Preoperative peak LVOT gradient, aortic annulus z-score & bicuspid aortic valve predict reintervention. Severity of associated AR is low but increases with follow-up time.

AR: Aortic regurgitation; CI: Confidence interval; HR: Hazard ratio; LVOT: Left ventricular outflow tract; OR: Odds ratio; SAS: Subaortic stenosis