# [Over 25 Years of Experience with the Ross Procedure in Children: A Single-Centre Experience.](https://www.ncbi.nlm.nih.gov/pubmed/31881194)

Martin E, Laurin C, Jacques F, Houde C, Cote JM, Chetaille P, Drolet C, Vaujois L, Kalavrouziotis D, Mohammadi S, Perron J.

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**Take Home Points:**

* This study boasts the longest and most complete dataset for people treated with a Ross procedure.
* Mortality in the early post-operative period is low.
* Paediatric Ross survival has good long term survival: 96.7% at 5 years and 94.4% at 25 years.
* Ross related re-interventions was twice as common for the pulmonary homograft than for the autograft.
* Freedom from autograft-related intervention was 98.1% at 5 years and 61.2% at 25 years.
* Freedom from pulmonary conduit re-intervention was 93.2% at 5 years and 28.3% at 25 years.



***Commentary from Dr. Blanche Cupido (Cape Town, South Africa), section editor of ACHD Journal Watch:*** In children, all available surgical options for aortic valve prostheses pose limitations. Both surgical repair techniques and balloon valvuloplasty are utilized to postpone valve replacement when possible. Though the Ross procedure is technically rather complex, it is a valuable and good option as aortic valve replacement in children. Re-intervention of the autograft and the pulmonary conduit have frequently been described and may impact longevity.

This single center study described the long term clinical and echocardiographic outcomes following the Ross procedure in children at a tertiary referral center in Canada. It is a retrospective review of consecutive children (under age 18) who underwent a Ross procedure between January 1990 and January 2018 – a total of 25 years’ experience with this procedure. Clinical, surgical and echocardiographic data was reviewed.

The primary outcome was in-hospital and long term survival. Long term valve-related outcomes and Ross-related interventions were also reviewed. Fifty-two percent of patients were followed up for > 20 years. Clinical data spanned 1019 person-years and echocardiographic data 977 person-years. Patients post-Ross procedure were followed up annually.

A total of 63 patients underwent the Ross procedure. (81% of this cohort was male). Fifty-four percent (n=34) of patients, had one or more open surgical procedure prior to the Ross procedure. 51% had previous surgical aortic valvuloplasty and 22% had previous percutaneous balloon valvuloplasty. On average, the Ross procedure happened 4.6 years after these procedures. Isolated aortic stenosis was the pathology in 46% of patients. In 10% of patients, the surgery was urgent, it was semi-elective in 31% and elective in 59%.

One patient died in the peri-operative period (1.6%). 6% of patients (n=4) required re-exploration for mediastinal bleeding. None required ECMO support. None developed in-hospital pulmonary autograft or homograft failure. Table 3 below shows the immediate post-operative outcomes:

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Two non-Ross related cardiac deaths occurred at 3.5 and 10.4 years post-Ross procedure respectively. Figure 1 below shows an overall survival of 98.4%, 94.4% and 94.4% at 1, 15 and 25 years respectively.

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Pulmonary autograft degeneration occurred in 19 patients (30%). None developed pulmonary stenosis. Fifteen of these patients had an autograft re-operation at a median of 15.9 years post-Ross procedure. Ten of these 15 patients, underwent autograft root-sparing procedure (David procedure). The other 5 had a Bentall procedure. No mortality was associated with re-operation. Freedom from pulmonary autograft reoperation was 100% at 1 year, 86.4% at 15 years and 61.2% at 25 years (see figure 2 below):

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Forty-nine (n=31) percent of patients developed degeneration of the pulmonary homograft with 23 patients undergoing re-intervention at a median of 11.1 years. Thirteen patients had pulmonary stenosis, 10 had pulmonary incompetence and 8 had a combination of the above lesions. Freedom from any homograft re-intervention was 96.7 % at 1 year, 58.2% at 15 years and 28.3% at 25 years: See figure 3 below)

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In total, 63% (n=40) patients developed a Ross-related failure around 12 years post-procedure. Of these, 31 patients had re-intervention on pulmonary conduit or pulmonary homograft at 11.9 years. At 1 and 25 years respectively, the freedom from a Ross related intervention (both surgical and percutaneous) was 96.7% and 26.3%. (see figure 4 below):



Six percent (n=4) developed infective endocarditis de novo.