



Guest Editor: Prof. Khalil Fattouch

What are the benefits of a minimally invasive approach in frail octogenarian patients undergoing aortic valve replacement?

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A best evidence topic was devised in light of a structured protocol.^[1] What is the advantage of (minimally invasive) approach in (frail patients) undergoing (aortic valve replacement)?

In cardiac outpatient clinic you review an 85-year old male with severe aortic valve stenosis, low left ventricular ejection fraction and creatinine clearance of less than 50 mL/min. Other comorbidities include treated pulmonary hypertension, mild cognitive impairment, marked limitation of ordinary physical activity and depression. You resolve to determine whether to recommend minimally invasive or conventional aortic valve replacement (AVR) or transcatheter aortic valve implantation (TAVI), however you are not sure of the differences of the impact of frailty on preoperative risk for each approach; hence you investigate the best evidence on the topic.

Using Medline, data was retrieved from 1980 to October 2015 via PubMed interface with the following terms: ('Mini', 'minimally', 'minimally invasive',) AND ('frail', 'frailty', 'Octogenarians',) AND ('AVR', 'Aortic valve surgery', 'Aortic valve',). Related articles and references were also screened for suitability.

Seventy three papers were found using the reported search. Only six papers were identified that provided the best evidence to answer the question. Some papers have to be excluded because of mixed age population data and not presenting separately outcomes for the minimally invasive operations. Majority of the included papers are presented in Table 1.

With increasing age of the population, more elderly pa-

tients are referred for an aortic valve operation. Minimally invasive procedures have been developed to improve post-operative outcomes for patients diagnosed with aortic stenosis disease and are deemed to undergo valve surgery. Studies have shown numerous advantages such as shorter LoS, reduced bleeding, improved cosmesis and patient satisfaction, less ventilation time for patients undergoing minimal invasive procedures compared to the traditional conventional method.^[2-5]

Gosev, *et al.*^[6] reviewed applications of minimally invasive approach on octogenarians and highlighted that almost half of them required blood transfusion and 3.8% of them needed re-operation for bleeding. Stroke and AF affected 4.4% and 16.5% of the population, respectively. The median length of stay for the octogenarians was 8 days with half of them being discharged to extended care facilities. Benefits from upper hemisternotomy approach as regards to shorter ventilation time and faster discharge from intensive care unit was also been shown by this group. They further commented on 15% rise in minimal invasive procedures for this group of patients for the period between 1997–2006. Even in re-operative cases, the mortality reported by this centre was only 2.8% compared to the STS predicted mortality of 9.7%.

Sharony, *et al.*^[7] compared minimal invasive approach to conventional sternotomy in elderly patients undergoing aortic valve operations with the application of propensity matching. They found that hospital mortality (6.9% vs. 6.9%), three year actuarial survival and postoperative complications (i.e., stroke, re-operation for bleeding, respiratory/renal failure & deep sternal wound infection) were

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Table 1. Best evidence papers.

Studies	Mini-invasive cases	Mean age; years (range)	STS score and EuroSCORE (%)	Outcome			
				Mortality (%)	Stroke or TIA (%)	HLOS (days)	Home discharge (%)
Gosev, <i>et al.</i> ^[6]	364	NR	6.8 and NR	4.9	4.4	8 (median)	40.1
Elbardissi, <i>et al.</i> ^[8]	249	80 (80–95)	10.5 and 11 (modified)	3	4	NR	NR
Sharony, <i>et al.</i> ^[7]	189	75 (65–95)	NR	6.9	3.7	10.9 (median)	52.6
Grossi, <i>et al.</i> ^[10]	469/731 (64%)	NR	NR and 17.2 (logistic)	7.8	3.7	NR	NR
Zierer, <i>et al.</i> ^[9]	30	82	NR and 35 (logistic)	10	3	12 (mean)	NR

HLOS: hospital length of stay; NR: not reported; STS: society of thoracic surgery; TIA: transient ischemic attack.

similar between the groups. However greater number of patients in the minimally invasive group was discharged home rather than to rehabilitation facilities reflecting better recovery. Hence minimally invasive approach encourages an improved resource utilization and as a result it's more cost-effective. In terms of surgical technique upper ministernotomy allows a good access to ascending aorta but has the potential of sternal instability especially in the elderly patients. In a few number of patients aortic atherosclerosis doesn't allow direct aortic cannulation and groin cannulation is used instead with complications such as aortic injury, aortic dissection, artheroembolism and limb ischemia. Right anterior thoracotomy can provide good access for direct aortic cannulation in cases where it's not contraindicated as commented by this group.

Elbardisi, *et al.*^[8] reviewed octogenarians who had undergone aortic valve procedures with minimally invasive approach. Their post-operative complications rates was quite low; stroke 4%, re-operation for bleeding 4% and the rest of common complications 1%. Operation mortality was 3% and ventilation duration was 16 ± 27 h. Some of the patients had re-operation procedures and their operative mortality rate was the same with that of first time operations. Stroke was identified as the single predictor of 30-day mortality. Female gender and severe chronic obstructive pulmonary disease (COPD) was highlighted as the most significant independent predictor of 6 month mortality. Overall long term survival at 1, 5, and 10 years was 91%, 77% and 56% respectively. These numbers are not significantly different when compared to that of an age and gender matched population. For high risk patients, 1-, 5-, 8- year survival is 89%, 74% and 49% respectively.

Zierer, *et al.*^[9] compared octogenarians who either had minimal invasive aortic valve procedure via upper partial sternotomy or TAVI. Interestingly early morbidity and mortality (10% vs. 14%; not significant) were comparable between the two groups. The only difference noted was in a longer ventilation time, ICU stay & hospital stay in the minimal invasive group. Two patients (10%) in the TAVI group ver-

sus one patient (3%) in the surgical group underwent re-exploration for bleeding. No differences were found in atrial fibrillation, stroke, pacemaker implantation and complete intra-ventricular block between the groups. After a mean follow-up of 12 ± 4 months there were 5 (24%) deaths in the TAVI group and 5(17%) deaths in the minimal invasive group.

Grossi, *et al.*^[10] investigated high-risk patients who underwent aortic valve replacement either through a median sternotomy or by the use of minimally invasive approach. Small right anterior thoracotomy was used in the majority of the minimally invasive cases and an upper ministernotomy in the rest. Around 70% of the population was septuagenarians or octogenarians. They identified that the use of a minimally invasive approach was associated with a reduced risk of hospital mortality (OR: 0.55; $P = 0.036$).

Advanced age has been highlighted as a predictor of poor outcomes following a conventional AVR.^[11] Saltesz, *et al.*^[12] looked at mortality of patients undergoing minimal invasive procedures. Out of the 890 total cases, 157 were of patients 80 years or older. The operative mortality was low (1.9%). For the re-operative cases ($n = 34$), no mortality was noted.

A minimally invasive approach is safe for frail octogenarians undergoing aortic valve procedure and offers advantages in terms of low mortality rates, shorter length of stay and fewer discharges to institution. More randomised studies are needed comparing surgical with trans-apical or transfemoral approach in this cohort of patients.

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