



Review of SAVR vs TAVI for low-, intermediate- and high risk patients

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Decision making SAVR vs TAVI



ATCSA202





Capodanno D. et al. Eur J Cardiothorac Surg. 2017;52(3):408-417.

Durability: Toronto stent-less valve









Low risk patients # Younger patiens



Low risk and young patient

Low risk patient

- Male 83 years
- 180 cm, 75 kg
- Hypertension
- SR
- AS (tricuspid valve)
- No other co-morbidities

Young patient

- Female, 60 years
- 165 cm, 80 kg
- Previous CABG
- Peripheral vessel disease
- Renal failure

Expected survival in Norway

Forvente	ventet gjenstående levetid for menn og kvinner på utvalgte alder st rinn.									\frown	
	0 år	1 år	5 år	10 år	20 år	30 år	40 år	50 år	60 år	70 år	80 år
Menn											
2014	80,03	79,24	75,29	70,33	60,44	50,80	41,20	31,74	22,81	14,79	8,19
Kvinner											
2014	84,10	83,28	79,31	74,33	64,39	54,51	44,70	35,08	25,92	17,39	9,89
) 	2				

Statistikkbanken kildetabell 05375

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12-15 years in difference in expected survival A 60 year old live longer than the valve

Review of the Partner trials -High risk -Intermediate risk -Low risk

Markham et Sharma, Intervent Cardiol Clin 9 (2020)461-467





High risk trials

- These are no longer an issue, these have been done
- The old and high risk patients become TAVI, even though an old patient can be low risk
- The question for high risk patients are now, who should **not** have TAVI
- For low risk patients it is should all have TAVI?



Do we already have long-term durability data on TAVI? No, but we shold expect some comprehensive data





The NEW ENGLAND JOURNAL of MEDICINE

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Five-Year Outcomes of Transcatheter or Surgical Aortic-Valve Replacement

R.R. Makkar, V.H. Thourani, M.J. Mack, S.K. Kodali, S. Kapadia, J.G. Webb, S.-H. Yoon, A. Trento, L.G. Svensson, H.C. Herrmann, W.Y. Szeto, D.C. Miller, L. Satler, D.J. Cohen, T.M. Dewey, V. Babaliaros, M.R. Williams, D.J. Kereiakes, A. Zajarias, K.L. Greason, B.K. Whisenant, R.W. Hodson, D.L. Brown, W.F. Fearon, M.J. Russo, P. Pibarot, R.T. Hahn, W.A. Jaber, E. Rogers, K. Xu, J. Wheeler, M.C. Alu, C.R. Smith, and M.B. Leon, for the PARTNER 2 Investigators*









Figure 1. Time-to-Event Curves for Death from Any Cause or Disabling Stroke to 5 Years.

Shown is the incidence of death from any cause or disabling stroke among patients assigned to transcatheter aortic-valve replacement (TAVR) and those assigned to surgical aortic-valve replacement. Values for incidence were calculated with the use of Kaplan–Meier methods and were compared with the use of the log-rank test. The number of patients at risk at 60 months includes patients with early visits ahead of the follow-up window.

PVL @ 2years : severe 8.5% vs 0.4% TAVI vs SAVR mild 25.2% vs 3.5*% Concomittant CABG/PCI 14.5% vs 3.9%, Valve SAVR vs TAVI 23.6% vs 3.9%

Gradient almost equal

Valve related rehospitalization x3 for TAVI





Increasing Number of TAVR Procedures in Younger Lower Risk Patients

 Trends in transcatheter and surgical aortic valve replacement (TAVR and SAVR) in the U.S. show yearly increases in the overall number of TAVR procedures and significant growth in TAVR utilization among younger adults with aortic stenosis.^{1,2}



Commercial TAVR procedures in the U.S.

TAVR and SAVR procedures by age group in the U.S.



²Sharma T, et al., *J Am Coll Cardiol*. 2023;80(2):2054-2056. Republished with permission from Elsevier Inc.

Studies for low risk



Fig. 1 | **Evolution of TAVI indications.** Over time, the indications for transcatheter aortic valve implantation (TAVI) have expanded to include patients at a lower operative risk (that is, a lower Society of Thoracic Surgeons (STS) score) and with less frailty. Several ongoing studies are exploring the indications for TAVI in asymptomatic severe aortic stenosis (AS), moderate AS with heart failure (HF), and severe aortic regurgitation (AR). The graph shows the STS and frailty score and the surgical risk classification of the patient cohort in each study plotted according to the year of study publication^{46,47}.





Fig. 2 | **Studies on TAVI versus SAVR in patients at different surgical risk and of similar age.** As shown in the graph, the decrease in the surgical risk of death, as assessed by the Society of Thoracic Surgeons (STS) risk score, in the successive trials on transcatheter aortic valve implantation (TAVI) versus surgical aortic valve replacement (SAVR) is driven by fewer comorbidities in the study cohort rather than by younger age.





PARTNER 3 and Evolut Low Risk PICO(T) analysis

PARTNER 3

P = Low risk (<4%)I = Sapien 3 C = SAVR O = D/stroke/re-HT = 12 months

Superiority

Mack MJ, et al. N Engl J Med. 2019;380:1695-1705



The NEW ENGLAND JOURNAL of MEDICINE

Transcatheter Aortic-Valve Replacement with a Ealloon-Expandable Valve in Low-Risk Patients

MAY 2, 2019

M.J. Maek, M.B. Leon, V.H. Thourani, R. Makkar, S.K. Koelali, M. Barson, S.R. Kapadia, S.C. Malaiseie, D.J. Cohen, P. Pibarot, J. Leipzic, R.T. Hahn, P. Blanks, M.R. Williams, J.M. McCabe, D.L. Brown, V. Baballaros, S. Goldman, W.Y. Szets, P. Generoux, A. Pershad, S.J. Pocsck, M.C. Nu, J.G. Webb, and C.R. Smith. for the PARTNER 1 Investigators ABSTRACT

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Incase of the Among plainess with annic meansis who are as intermediate or high risk for death with surgery, major ourcomes are similar with transcuberr artic-take replacement. (TOVE) and surgical anticivale opticament. There is insufficient withouse replace and a distance optical anticivale replacement. There is insufficient withouse replacement ing she comparison of the two procedures in pasients who are a law titls. bowheatth.org. We nawdomly assigned parients with severe aartic seconds and low surgical this to mainter inter al the DARTMER I income

undergo either TRFE with stansfermont placement of a balloom-supandable sales ligations is provided in the Supplement tary Appendix, available at NUM ang or survery. The primary and point was a composite of death, arrive, or rehospicallus-This article was published on March 16. ion as 1 year. Both wanishtrioticy straing (with a prospecified margin of 6 percent 30.8 et NUM-erg age points) and superiority sensing were performed in the an-reased population.

Hing the fide and the AND Multiple As 71 creaters, 1000 micross anderwise tandomination. The mean age of the papers: compt o in thesation make new

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was 75 years, and the mean Society of Thoracle Surgeons risk score was 1.9% (with cores ranging from 0 to 100% and higher scores indicating a groater risk of death widow 30 days alter the procedures. The Kaplan-Meter exeitance of the rate of the primary composite and point at 1 year was significantly lower in the TAVR group han in the surgery group (0.5% vs. 15.7%; absolute difference, -6.6 perpoints, 97% confidence interval (CI), -30.8 at -2.5, Publicit for activitationics hazard nacio, 0.54, 99%. CI, 0.37 to 0.79, P=0.001 for superiority). A: 30-days, TMVR. teached in a lower rate of service than surgery (P=0.02) and in lower rates of death or arrive (D-1001) and arre-more arright fibriliation (D-0.007). TATE that was had is a there right hopitalisation than support (Publicat) and in a lower tisk of a poor steamess outcome (death or a low Kassas City Cattionsyspady Questions airte scored at 30 days (P-0.001). There were no significant between group differences in major vascular complications, now permanent patemaker inservons, or moderate or severe paravalvalar regargication.

Among pacients with severe annic stanosis who were a low surgical fish, the rate of the composite of death, serois, or rehospicalization at 1 year was significantly lower with TAWE than with surgery. (Funded by Edwards Lifesciences, PARTHER 3 (SwiralWalkow sumber, SCHOR71114)

EVOLUT R LR TO NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients

Jeffrey J. Popera, M.D., G. Michael Deeb, M.D., Steven J. Yakabov, M.D., Multashir Muretaz, M.D., Hereal Gada, M.D., Daviel O'Hais, M.D., Tarwir Bajura, M.D., John C. Heiser, M.D., William Merhi, D.D., Neal S. Kleiman, M.D., Judah Askew, M.D., Paul Sorajja, M.D., Jonhoa Rovin, M.D., Stanley J. Chetcuti, M.D., David H. Adaros, M.D. Paul S. Teinstein, M.D., George L. Zurn III, M.D., John K. Forrest, M.D., Didler Tchetché, M.D., Jon Resar, M.D., Antony Walton, M.D., Nicolo Piatra, M.D., Ph.D., Basel Ramlani, M.D., Newell Robinson, M.D., ossian, M.D., Thomas G. Gleason, M.D., Jan K. Oh, M.D. Michael J. Boulware, Ph.D., Hongyan Qiao, Ph.D., Andrew S. Mugglin, Ph.D., and Michael J. Beardon, M.D., for the Evolut Low Risk Trial Investigators?

ABSTRACT

The author's effectives are load to de Agenchic Address myde's speer in the factor of the second second and the second second second second second biol (and Second Minist Gene). This is include a second with a second second second 101 Digits Ids, Becon, MARSIN and 101 Digits Ids, Becond, Becon, MARSIN and 101 Digits Ids, Becond, Becond,

We performed a randomized noninferiority trig in which TWE with a self-expand 9. complete list of investigators, instituing suprassionlar hisprochesis was compared with surgical astric-rabe replacements

tions, and research personnel partici-paring in the Bolat Low Bolt Trial is employed in the Trial Low in pacients who had severe aorde menosis and were at low surgical risk. When ESI unitery Appen patients had reached 13-towed fellow-up, we analyzed data regarding the primary site, available at NUM.org. end point, a composite of death or disabling survive as 3d matchs, using Rapesia This article was published on March 36, 2020, at NE(M.org.

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K Togel J Mark 2009 (Non-Divert LTC TOPs 10: 2016) [PM prime 2016 AUT.

Of the 1468 backness who underwate the dottin actors, an appendent TWR or surplical procedure was performed in 1405. The packnest mean age was 74 years. The 24 minch emittand locidesce of the primary end poiss was 5.3% is the YAVR group and 6.7% in the surgery group (difference, -1.4 percentage points, 97% Layosian credible inserval for difference, -4.9 to 2.1, posterior probability of noninferintry >0.999). At 30 days, pasieses who had undergone TAVR, as compared with nurgery, had a lower incidence of dualting sense (0.76 vs. 1.76), thereing complications (2.46 vs. 7.36), acute kidney lejuty (0.96 vs. 2.8%), and actual fibrillation (7.76 vs. 35.4%) and a higher incidence of moderate or severe atroic regurgination (3.9% vs. 0.9%) and pacemation implayation (17.4% vs. 6.7%). At 13 months, patients in the TAVE group had lower acroic-valve gradients than those in the surgery group (0.6 mm Hg vs. 11.2 mm Hz) and larger effective orifice areas (23 cm² vs. 2.0 cm²).

In pasients with severe acreic mesonic who were as low surplical risk. TAVE with a add-extraodies autranamiar bioproschesis was applializion to surgery with respect to the composite and point of death or disabling service at 26 months. (Funded by Methonic, Clinical Trials gov exampler, IVCTU2701280.3

$P = Low risk (\leq 3\%)$ = Evolut R or Pro C = SAVR $\mathbf{O} = \text{Death/stroke}$ T = 24 months

Non-inferiority

Popma JJ, et al. N Engl J Med. 2019;380:1706-1715





Case Selection



PARTNER 3

52% Excluded



16% Excluded







PARTNER 3: Finally, Who's in.....



Table 1. Characteristics of the Patients at Baseline. ^e					
Characteristic	As-Treate	d Analysis	Intention-To-Treat Analysis		
	TAVR (N=725)	Surgery (N=678)	TAVR (N=734)	Surgery (N=734)	
Age — yr	74.1±5.8	73.6±5.9	74.0±5.9	73.8±6.0	
Female sex — no. (%)	261 (36.0)	229 (33.8)	266 (36.2)	246 (33.5)	
NYHA class — no. (%)					
1	76 (10.5)	63 (9.3)	77 (10.5)	73 (9.9)	
н	467 (64.4)	422 (62.2)	476 (64.9)	456 (62.1)	
ш	181 (25.0)	190 (28.0)	180 (24.5)	202 (27.5)	
IV	1 (0.1)	3 (0.4)	1 (0.1)	3 (0.4)	
STS-PROM — %†	1.9±0.7	1.9±0.7	1.9±0.7	1.9±0.7	
Diabetes mellitus — no. (%)	228 (31.4)	207 (30.5)	228 (31.1)	224 (30.5)	
Serum creatinine >2 mg/dl — no. (%)	3 (0.4)	1 (0.1)	3 (0.4)	1 (0.1)	
Dialysis — no. (%)	0	1 (0.1)	0	1 (0.1)	
Hypertension — no./total no. (%)	614/724 (84.8)	559/677 (82.6)	622/733 (84.9)	608/733 (82.9	
Peripheral arterial disease — no./total no. (%)	54/718 (7.5)	56/678 (8.3)	55/727 (7.6)	62/733 (8.5)	
Cerebrovascular disease — no. (%)	74 (10.2)	80 (11.8)	74 (10.1)	84 (11.4)	
Chronic obstructive pulmonary disease — no./total no. (%)	104/695 (15.0)	117/649 (18.0)	106/703 (15.1)	121/703 (17.2)	
Cardiac risk factors					
SYNTAX score:	1.9±3.7	2.1±3.9	1.9±3.7	2.1±3.8	
Previous coronary-artery bypass surgery no. (%)	18 (2.5)	14 (2.1)	18 (2.5)	17 (2.3)	
Previous percutaneous coronary intervention - no. (%)	103 (14.2)	87 (12.8)	102 (13.9)	93 (12.7)	
Preexisting pacemaker or defibrillator — no. (%)	23 (3.2)	26 (3.8)	25 (3.4)	28 (3.8)	
Previous myocardial infarction no. (%)	48 (6.6)	33 (4.9)	49 (6.7)	39 (5.3)	
Previous atrial fibrillation or atrial flutter — no./total no. (%)	111/722 (15.4)	98/678 (14.5)	113/731 (15.5)	109/734 (14.9)	
Aortic-valve gradient — mm Hg§	47.0±12.1	46.6±12.2	47.2±12.3	46.7±12.2	
Aortic-valve area — cm²§	0.8±0.2	0.8±0.2	0.8±0.2	0.8±0.2	
Left ventricular ejection fraction %	61.7±7.9	61.9±7.7	61.7±7.9	61.9±7.7	











PARTNER 3: Age Distribution



PARTNER 3



Low risk trials at TCT 2023 PARTNER 3 and Low risk Evolut

Transcatheter Aortic-Valve Replacement in Low-Risk Patients at Five Years

Michael J. Mack, M.D., Martin B. Leon, M.D., Vinod H. Thourani, M.D., Philippe Pibarot, D.V.M., Ph.D., Rebecca T. Hahn, M.D.,
Philippe Genereux, M.D., Susheel K. Kodali, M.D., Samir R. Kapadia, M.D., David J. Cohen, M.D., Stuart J. Pocock, Ph.D., Michael Lu, Ph.D., Roseann White, Ph.D., Molly Szerlip, M.D., Julien Ternacle, M.D.,
S. Chris Malaisrie, M.D., Howard C. Herrmann, M.D., Wilson Y. Szeto, M.D., Mark J. Russo, M.D., Vasilis Babaliaros, M.D., Craig R. Smith, M.D., Philipp Blanke, M.D., John G. Webb, M.D., and Raj Makkar, M.D., for the PARTNER 3 Investigators*







EVENTS CALENDAR >

ANNUAL MEETING >

<u>MEMBERSHIP ></u>

Joint Statement from STS and EACTS regarding Aortic Valve Replacement in Low-Risk Patients

In collaboration with the Society of Thoracic Surgeons, EACTS has published a joint statement in response to new TAVI/SAVR research on low-risk patients.

Statement

The <u>Society of Thoracic Surgeons (STS)</u> and the <u>European Association for Cardio-</u> <u>Thoracic Surgery (EACTS)</u> embrace Transcatheter Aortic Valve Implantation (TAVI) and Surgical Aortic Valve Replacement (SAVR) as outstanding therapeutic options for patients with aortic stenosis. TAVI has proven to be an excellent innovation, particularly for patients of advanced age or risk, that all surgeons and cardiologists unequivocally support through proper functioning multi-disciplinary heart teams.











Clinical Implications

The 5-year follow-up findings from the PARTNER 3 trial reaffirm the clinical and echocardiographic benefits of SAPIEN 3 TAVR as a meaningful alternative to surgical therapy for low-risk severe, symptomatic AS patients!

EVOLUT LOW RISK TRIAL | 4 YEAR RESULTS OBJECTIVE

• To evaluate 4-year clinical and hemodynamic outcomes with TAVR vs SAVR in patients from the Evolut Low Risk trial



EVOLUT LOW RISK TRIAL

4 YEAR RESULTS IN JACC

ARTICLE IN PRES JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOG

V CL. . NO. . . 2023 ISSN 0735-1097/536.00

Letters

RESEARCH LETTER

4-Year Outcomes of **Patients With Aortic** Stenosis in the Evolut Low Risk Trial

A recent 3-year analysis of the Medtronic Evolut Transcatheter Aortic Valve Replacement in Low Riv Patients trial (NCT02701283) d emonstrat ed sust? valve performance and durable benefits cor 00 all-cause mortality or disabling stroke expanding transcatheter compared O aortic valve replacement (TAVR v' surgical-risk patients with seve red Close follow-up of the low-r' arranted given the limited in ∠-term data currently availab' nent de-S cisions in these patier remain good surgical candidat we report the 0 4-year outcom aized Evolut Low Risk trial. Comp Evolut Low Risk study

desig dity have been described.2 erwent aortic valve replacesanding supra-annular CoreValve/ dtronic) or a surgical bioprosthesis J16 to May 2019 and are being followed ding stroke through 2 years,2 with annual porting of this outcome prespecified in the study disabling stroke, or aortic valve rehospitalization was rotocol. Additional endpoints in this 4-year analysis

What is the clinical question being addressed? What are the 4-year outcomes of patients randomized to TAVR vs SAVR in the Evolut Low **Risk Trial?** What is the main finding?

There was a 26% reduction (P = 0.05) in all-cause mortality or disabling stroke with TAVR vs SAVR, and the difference expanded over time.

include safety events and as determined by echocardior lomes were reported as Kaplan-₄ n umber of patients with an ev .ompared by log-rank test. Er atcomes were based on echo aboratory assessment. The s approved by the c Institutio at each site, and all informed consent patier SP ients (730 TAVR, 684 SAVR) .mpted implantation. Four-year

sable for 94.7% of TAVR patients 2 withdrew, 7 were lost to follow-up, 1 4 89.2% of SAVR patients (610/684; 60 w, 14 were lost to follow-up). At baseline, .nts had a mean age of 74 years in both catment arms and mean Society of Thoracic Surgeons Predicted Risk of Mortality scores of 2.0 in the TAVR group and 1.9 in the SAVR group. There were no significant baseline differences between groups.

The primary endpoint of all-cause mortality or disabling stroke at 4 years was 10.7% (76) in the TAVR group and 14.1% (90) in the SAVR group (HR: 0.74; 95% CI: 0.54-1.00; P = 0.05), representing a 26% relative reduction in the hazard for death or disabling stroke with TAVR compared with SAVR. The absolute difference between treatment arms for the primary endpoint continued to increase over time: -1.8% at 1 year, -2.0% at 2 years, -2.9% at 3 years, and -3.4% at 4 years (Figure 1). Rates of the primary endpoint components were 9.0% (64) vs 12.1% (76) (P = 0.07) for s. The primary endpoint of the Evolut Low all-cause mortality and 2.9% (20) vs 3.8% (24) al is the composite of all-cause mortality or (P = 0.32) for disabling stroke with TAVR vs SAVR, respectively. The composite of all-cause mortality, significantly lower with TAVR compared with SAVR (18.0% [128] vs 22.4% [144]; HR: 0.78; 95% CI 0.61-0.98; P = 0.04). Aortic valve rehospitalization was

10.3% (71) with TAVR vs 12.1% (75) with SAVR (P = 0.27). New permanent pacemaker implantation was significantly higher in the TAVR group (24.6% [171] vs 9.9% [62]; P < 0.001). Indicators of valve performance including aortic valve reintervention (1.3% [9] TAVR vs 1.7% [10] SAVR; P = 0.63), clinical or subdinical valve thrombosis (0.7% [5] TAVR vs 0.6% [4] SAVR: P = 0.84), and valve endocarditis (0.9% [6]

Reproduced with Permission from Forrest JK, et al. J Am Coll Cardiol. 2023:ePub Oct 24.

Primary Endpoint: All-Cause Mortality or Disabling Stroke



How can they be so different?

Low risk trials at TCT 2023

PARTNER 3 and Evolut Low Risk trials presented

Highly selected cohorts in industry sponsored trials

PARTNER 3 : non-inferiority of TAVI, published in NEJ

Evolut Low Risk Trial : Superiority of TAVI, published as a Research letter in JACC

The two trials are not comparable, anatomcal screening exclusion higher in PARTNER, hence mortality 14.1% vs 8.2 % in Evolut vs PARTNER trial for SAVR

In additon concomittant procedures in 26% of procedures in SAVR group in both trials

Real world analysis in STS Database: isolated AVR

- 92.9% survival @ 5 years, TAVI in Partner Trial 90%
- 90.0% survival @ 8 years
- Better survival of patients < 75 years and STS-PROM < 1%
- 42000 patients, 19000 at risk at 5 years
- 26% of surgical patients in the two low risk trials underwent concomittant procedures (CABG, MV surg, ablation), patients with ischemic disease are different than those with isolated arotic valve disease, results are accordingly

SURGICAL EXPLANT DATA Associated with high 30-day operative mortality 10-13%



Hirji et al. J Am Coll Cardiol. 2020 Oct, 76 (16) 1848–1859



Bapat et al. J Am Coll Cardiol Intv. 2021;14(18):1978-1991



Summary

- It is now >20 years since first TAVI
- First there were trials for high risk patients, now trials are in low risk patients
- Though, the patients were quite old in all the low risk studies
- For now we should focus more on the age of the patient for lifetime management and risk
- Still we need long term follow up, especially regarding durability

