

Wilfried Wisser¹ , Marie-Elisabeth Stelzmueller¹ , Sabine Kappl² , Guenther Laufer¹

¹Department of cardiac surgery, Medical University Vienna, Vienna, Austria, ²Department of Cardiothoracic Anesthesia and Intensive Care, Medical University of Vienna, Austria

Background:

Minimal invasive surgery on atrio-ventricular valves, isolated or in combination with ASD closure and MAZE procedures is an established surgical procedure. With the help of 3D endoscopes, totally endoscopic approach is on the leap to become the new standard in mitral valve surgery. Thus, operations can be carried out through a single working port without any rib spreading. Whereas visualisation with 3D cameras is even superior to conventional surgery, the freedom of movements of instruments is reduced, the smaller the incisions are made. Precise preoperative planning is a key to achieve excellent results with low conversion and high repair rates.

The aim of this study was to develop a morphometric measurement tool for educational purposes to predict operability in a totally endoscopic way for patients undergoing mitral valve repair.

Method:

From 1/2020 to 3/2023, all 79 consecutive patients who were referred for totally endoscopic mitral valve repair (TE-MVR) were included into this retrospective analysis.

	Mean ± stdev	range
Gender (male/female)	51 / 28	
Age (years)	59,6 ± 12,3	27,9 – 82,2
Height (m)	1,75 ± 0,1	1,48 – 1,90
Weight (kg)	76,3 ± 14,5	46 – 122
BMI	24,8 ± 3,7	19 – 34
ES log	3,0 ± 2,2	1,5 – 14
ES II	1,4 ± 0,9	0,5 – 4,3
LVEF < 50% (n)	10	
PAPsys 31-55mmHg (n)	33	
PAPsys > 55mmHg (n)	6	
Creatinine	0,88 ± 0,17	0,65 – 1,29
Creatinine clearance	94,4 ± 28,6	36 – 178
Chronic lung disease (n)	10	

64 patients underwent TE-MVR, 15 patients were deemed to be unsuitable for TE-MVR on clinical and experience grounds because of too narrow space and/or anticipated complex repair techniques. Those underwent repair through sternotomy (MVR-open).

All patients underwent routine angio-CT scanning for preoperative planning. The following measurements were taken:

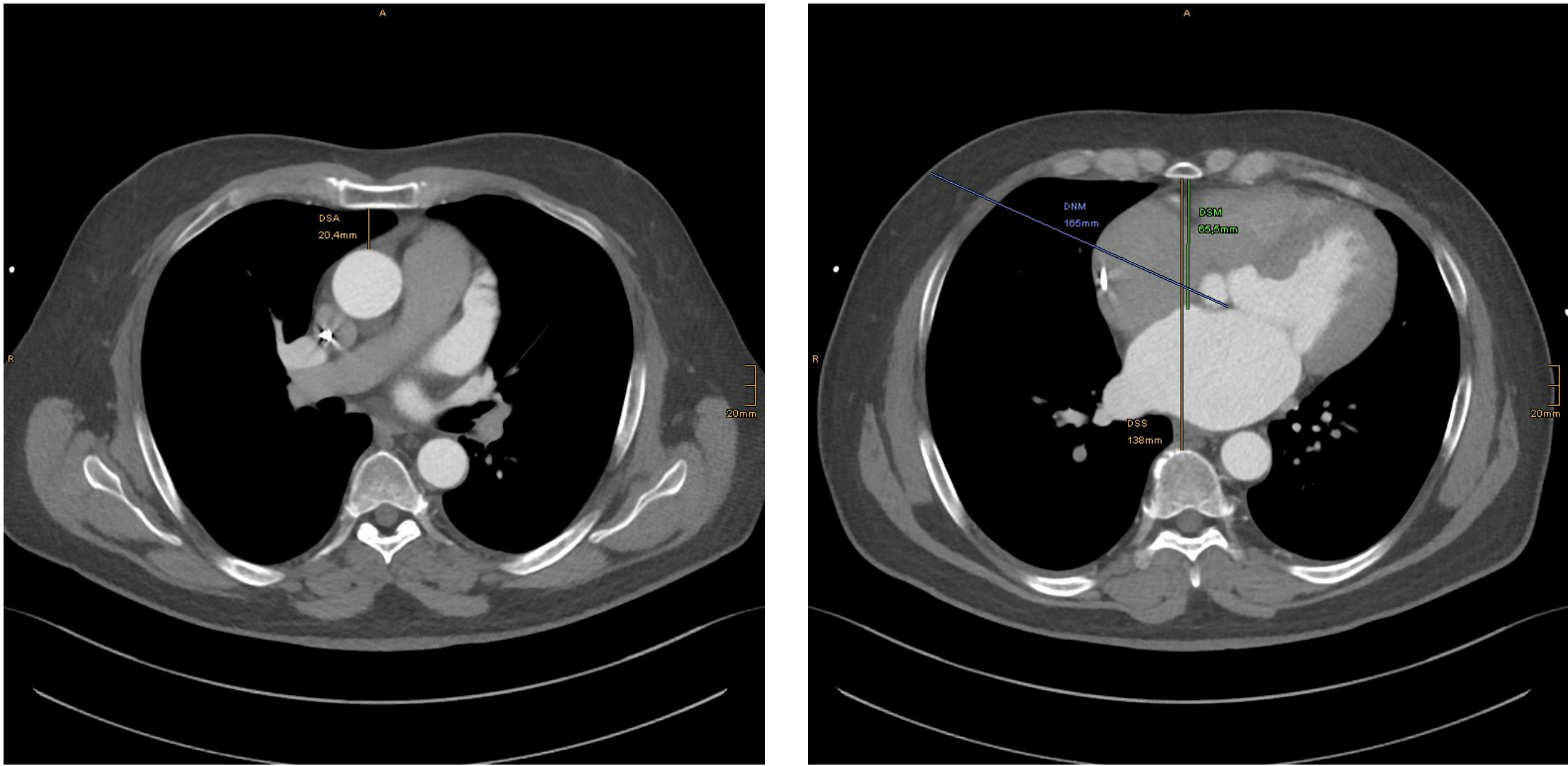
On axial image view at the level of the midportion of the mitral valve:

DSS – distance between sternum and spine

DSM – distance between sternum and anterior anulus of the mitral valve

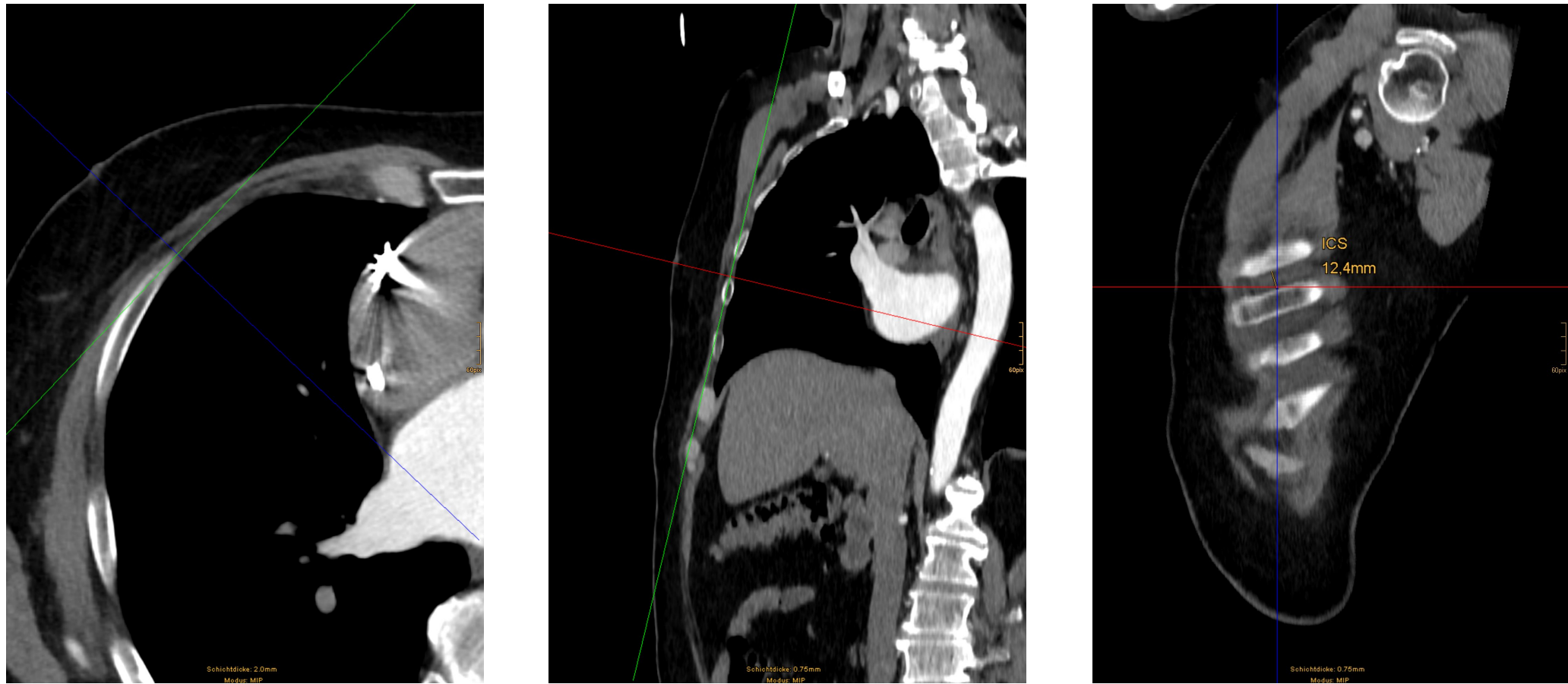
DSA – distance between sternum and aorta

DNM – distance between the nipple as the marker of the working port and the anterior annulus of the mitral valve



In a multiplanar reformatting:

ICS – width of the intercostal space just below the nipple at the level of thoracotomy



Results:

The repair rate in all patients was 98,7%. The 30-day survival was 100 %. One patient in the TE-MVR group was converted to sternotomy because the lungs did not collapse, prohibiting the approach to the mitral valve. One patient in each group underwent rethoracotomy due to bleeding (1,5% vs. 6,7%, in TE-MVR vs. MVR-open).

Mitral valve pathology:

	TE-MVR	MVR-open
n	64	15
Prolaps posterior leaflet	45	7
Prolaps anterior leaflet	4	6
Commissural prolapse	13	4
M. Barlow	14	2
Ring dilatation	3	2

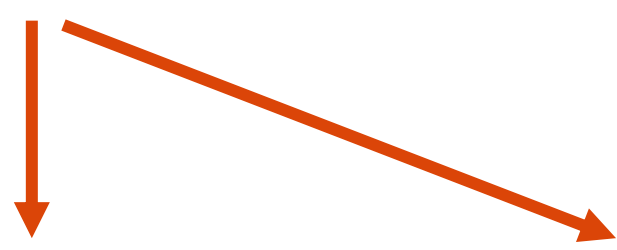
Operative Data:

	TE-MVR	MVR-open
MVR	63 (98%)	15 (100%)
annuloplasty	63	15
Loops	47	11
Loops number	4,3±1,3	4,1±,9
Triangular resection	1	3
Cleft closure	9	0
Chordae transfer	2	1
Ring Decalcification	0	2
TVR	6 (9%)	8 (53%)
ASD	9 (14%)	1 (6%)
MAZE	15 (23%)	6 (40%)

Immediately after each surgery the subjective impression of the technical points of the procedure was recorded. This resulted in two groups. Out of the 63 patients who underwent TE-MVR, in 21 patients the procedure was found to be technically demanding due to friction and collision of the instruments as well as less freedom to move the instruments (TE-MVR-demanding). The remaining patients were found to be technically unspectacular (TE-MVR-easy).

The following preoperatively measured and retrospectively analysed morphometric parameters found to be significantly different between the two groups:

	TE-MVR	MVR-open	p
DSS	130,4±18,8	108,1±17,3	0,00007
DSM	70,7±12,1	58,5±13,6	0,00101
DSA	31,6±8,5	22,3±9,8	0,00043
DNM	147,2±13,5	147,5±15,4	ns



	TE-MVR-easy	TE-MVR-demanding	p
DSS	130,3±20,2	130,5±16	ns
DSM	71,6±13,5	69±8,8	ns
DSA	32,4±8,8	30±7,6	ns
DNM	144,6±12,3	152,2±14,7	0,03401

Since the morphometric parameters influence each another, a composite parameter was calculated, consisting of the available space in the thorax (DSS), the available space of the working port (ICS) and the distance of the mitral valve from the working port (DNM) resulting in: DSS plus 4xICS minus DNM.

	DSS + 4xICS - DNM	p
TE-MVR	49,3±25,8	0,00389
MVR-open	25,6±34,8	
TE-MVR-easy	53,3±23,3	0,04159
TE-MVR-demanding	39,8±26,7	

Conclusion:

Individual surgical skills and long expertise is mandatory to achieve excellent results with low conversion and high repair rate.

For educational demands the composite morphometric parameter (DSS + 4xICS - DNM) may be an easy but strong parameter to predict the possibility of TE-MVR with a low conversion rate and high success rate, as well as the ease of TE-MVR.