

# Commentary to: ‘Comparing Mid-Term Outcomes of Cox-Maze Procedure and Pulmonary Vein Isolation for Atrial Fibrillation After Concomitant Mitral Valve Surgery: A Systematic Review’

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## Abstract

There are no solid evidence from literature that compare Cox-Maze with pulmonary vein isolation technique for atrial fibrillation in the context of concomitant mitral valve surgery. While the first is perhaps more effective and linked to higher freedom from atrial fibrillation, it is more invasive compared to the pulmonary isolation.

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In 1987 Dr James Cox described the first surgical technique to treat atrial fibrillation (AF). This procedure was based on a standardized ‘cut-and-sew’ approach with the aim to convey the native sinus impulse to both atria and atrioventricular node while suppressing re-entrant circuits (1). This original version (named ‘Cox-Maze’) was affected by high rate of post-operative pacemaker implantation. Further versions were introduced to improve the outcomes, finally resulting in the Cox-Maze III. Prasad and Colleagues examined the long-term performance of Cox-Maze III either as a lone operation or as concomitant procedure and reported excellent freedom from atrial fibrillation at distance (2).

In order to achieve an even more simple and less invasive approach, in 2002, Damiano and colleagues replaced the majority of the incisions of the Cox-Maze III with sets of bipolar radio-frequency (RF) and cryothermal ablations lines and finally this approach was named Cox-Maze IV. This simplified technique led to a significant increase in the number of operations performed annually for AF (3).

Pulmonary vein isolation (PVI) is however, a more popular approach for treating AF given its simplicity and rapidity. In contrast to the bi-atrial maze lesion set that requires right and left atriotomies, the PVI involves the creation of circumferential ablation lesions around the pulmonary veins. In addition, it can be performed also without the need of cardiopulmonary bypass (4).

PVI technique is directed mainly at the triggers of AF, whereas maze lesions ablations lines aim to interrupts pathways needed for maintenance of the arrhythmia (4).

Surgical ablation concomitant to mitral valve surgery has been shown to be associated with improved early outcomes as such as reduced early mortality and post-operative stroke (5).

Data on the comparative effectiveness of the Cox-Maze vs. PVI during concomitant mitral valve surgery are very limited.

To address this gap in literature, Sef and Colleagues conducted a systematic review and meta-analysis to compare mid-term mortality (after 12 months follow-up) and recurrence of AF after concomitant Cox-Maze and PVI in patients with AF undergoing mitral valve surgery (6). Secondary outcomes included: cardiopulmonary bypass and cross clamp time, rate of mitral valve repair and duration of preoperative AF.

After literature search, three randomized controlled trials (RCT) and three non-randomized studies of intervention (NRSI) were included with 790 patients in total (532 concomitant Cox-Maze and 258 PVI 45 during mitral valve surgery).

There was no difference in terms of mortality after 12-months between the two procedures. Nevertheless, considering the limited number of enrolled patients, meta-analysis resulted in wide confidence interval, hence substantial uncertainty remains.

With regard to AF recurrence, most of the studies reported that Cox-Maze was associated to higher freedom from arrhythmia at 12-months follow-up when compared to PVI. On this basis, they concluded that concomitant Cox-Maze in patients undergoing mitral valve surgery was associated with a strong tendency of better mid-term freedom from AF.

Authors have to be commended for this interesting quantitative synthesis that compare Cox-Maze with PVI during mitral valve surgery. First and foremost, they are shedding light to the need and benefits of addressing AF at the time of surgery.

It is important to underscore that nowadays many mitral procedures are carried out in the minimally invasive way, hence the Cox-Maze approach may be not entirely feasible in such context.

It is also noticeable that evidences from literature are scares, with many underpowered studies and with high heterogeneity. As such certain ambiguity remains and more studies are needed to established what procedure is more effective.

Although the Cox-Maze may be linked with higher success rate, in an era of less invasive, hybrid and wire skilled techniques, more practical, fast and reproducible approaches are probably to be preferred.

## **GLOSSARY**

AF= Atrial fibrillation

NRSI= non-randomized studies of intervention

PVI= Pulmonary vein isolation

RCT= Randomized controlled trial

RF= Radiofrequency

## REFERENCES

1. Cox JL, Ad N, Palazzo T. Impact of the maze procedure on the stroke rate in patients with atrial fibrillation. *J Thorac Cardiovasc Surg.* 1999 Nov;118(5):833-40. doi: 10.1016/s0022-5223(99)70052-8. PMID: 10534688
2. Prasad SM, Maniar HS, Camillo CJ, Schuessler RB, Boineau JP, Sundt TM 3rd, Cox JL, Damiano RJ Jr. The Cox maze III procedure for atrial fibrillation: long- term efficacy in patients undergoing lone versus concomitant procedures. *J Thorac Cardiovasc Surg.* 2003 Dec;126(6):1822-8. doi: 10.1016/s0022-5223(03)01287-x. PMID: 14688693.
3. Robertson JO, Saint LL, Leidenfrost JE, Damiano RJ Jr. Illustrated techniques for performing the Cox-Maze IV procedure through a right mini-thoracotomy. *Ann Cardiothorac Surg.* 2014 Jan;3(1):105-16. doi: 10.3978/j.issn.2225-319X.2013.12.11. PMID: 24516807; PMCID: PMC3904342
4. Gillinov AM, Gelijns AC, Parides MK, DeRose JJ Jr, Moskowitz AJ, Voisine P, Ailawadi G, Bouchard D, Smith PK, Mack MJ, Acker MA, Mullen JC, Rose EA, Chang HL, Puskas JD, Couderc JP, Gardner TJ, Varghese R, Horvath KA, Bolling SF, Michler RE, Geller NL, Ascheim DD, Miller MA, Bagiella E, Moquete EG, Williams P, Taddei-Peters WC, O’Gara PT, Blackstone EH, Argenziano M; CTSN Investigators. Surgical ablation of atrial fibrillation during mitral-valve surgery. *N Engl J Med.* 2015 Apr 9;372(15):1399-409. doi: 10.1056/NEJMoa1500528. Epub 2015 Mar 16. PMID: 25853744; PMCID: PMC4664179
5. Badhwar V, Rankin JS, Ad N, Grau-Sepulveda M, Damiano RJ, Gillinov AM, McCarthy PM, Thourani VH, Suri RM, Jacobs JP, Cox JL. Surgical Ablation of Atrial Fibrillation in the United States: Trends and Propensity Matched Outcomes. *Ann Thorac Surg.* 2017 Aug;104(2):493-500. doi: 10.1016/j.athoracsur.2017.05.016. Epub 2017 Jun 29. PMID: 28669501.
6. Sef D, Trkulja V, Raja SG, MD, Hooper J, Turina M. Comparing Mid-Term Outcomes of Cox-Maze Procedure and Pulmonary Vein Isolation for Atrial Fibrillation After Concomitant Mitral Valve Surgery: A Systematic Review. *JOCS.* In press.