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Long-term Outcomes of the Cox Maze III Procedure versus Radiofrequency Catheter Ablation for the Treatment of Atrial Fibrillation

Andrea Nguyen

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Abstract
Background: Atrial fibrillation is a challenging medical condition affecting over 2 million Americans today. The cure for atrial fibrillation has been controversial; however, radiofrequency catheter ablation and the Cox maze III procedure have been forerunners as curative therapies for decades. At this time, there is no medical evidence promoting one therapy over the other using reoccurrence of atrial fibrillation and the need for additional pharmaceutical therapy as endpoints. Both undesirable outcomes should be the primary measure of long-term efficacy of treatment to determine the gold standard. A systematic review was performed on current clinical evidence and the quality of evidence was evaluated with the GRADE working group tool.

Method: An exhaustive search of available medical literature was conducted using EBM Reviews Multifile, Medline and CINAHL databases. Keywords used were atrial fibrillation, radiofrequency catheter ablation, maze and long term. Studies not evaluating atrial fibrillation solely and studies not evaluating radiofrequency catheter ablation and the Cox maze III procedure as primary procedures were excluded from the review.

Results: Four observational case series met the inclusion and exclusion criteria. Long-term follow-up showed the necessity of repeat ablation procedures for approximately a 50% cure rate in comparison to over a 90% cure rate in patients who underwent the Cox maze III procedure once.

Conclusion: The Cox maze III, although having a slightly higher risk for mortality, has shown a significantly higher and long-term cure rate. Using the GRADE tool, the studies examined yielded low quality evidence indicating further investigation is warranted with higher quality studies and larger study samples.

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Long-term Outcomes of the Cox Maze III Procedure versus Radiofrequency Catheter Ablation for the Treatment of Atrial Fibrillation

Andrea Nguyen

A course paper presented to the College of Health Professions in partial fulfillment of the requirements of the degree of

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Faculty Advisor: Mark Pedemonte, M.D.
Clinical Graduate Project Instructors: Torry Cobb, DHSc, MPH, PA-C & Annjanette Sommers MS, PAC
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Background: Atrial fibrillation is a challenging medical condition affecting over 2 million Americans today. A cure for atrial fibrillation has been controversial, however, radiofrequency catheter ablation and the Cox maze III procedure have been forerunners as curative therapies for decades. At this time, there is no medical evidence promoting one therapy over the other using reoccurrence of atrial fibrillation and the need for additional pharmaceutical therapy as endpoints. Both undesirable outcomes should be the primary measure of long-term efficacy of treatment to determine the gold standard. A systematic review was performed on current clinical evidence and quality of evidence was evaluated with the GRADE working group tool.

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Conclusion: The Cox maze III, although having a slightly higher risk for mortality, has shown a significantly higher and long-term cure rate. Using the GRADE tool, the studies examined yielded low quality evidence indicating further investigation is warranted with higher quality studies and larger study samples.

Keywords: Atrial fibrillation, Cox maze III, radiofrequency catheter ablation, long-term
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INTRODUCTION

Background

Atrial fibrillation, the most prevalent sustained cardiac arrhythmia, increasing in frequency with age, has posed as a formidable challenge for cardiologists to medically manage. Over 2 million Americans suffer from atrial fibrillation, placing these patients at an increased risk for cerebrovascular accidents (American Heart Association, 2010). Additionally, 15% of strokes occurring annually are within the atrial fibrillation population (American Heart Association, 2010). In an attempt to reduce cerebrovascular accidents, anticoagulation therapy is given to patients with atrial fibrillation, in combination with pharmacological or procedural attempts to return patients to normal sinus rhythm. Symptoms of atrial fibrillation include, but are not limited to: palpitations, low blood pressure, weakness, fatigue, lightheadedness, confusion, shortness of breath and chest pain (Mayo Clinic, 2010). Symptomatic improvement directly results in a significant, quantifiable improvement in the patients’ quality of life (Lundberg et al., 2008). Antiarrhythmics and rate control pharmaceuticals, provide a low cost, low risk treatment option for patients, however these therapy options are also correlated with a lower efficacy rate as well as significant side effects from the drugs themselves. More invasive procedures would consist of cardioversion, catheter ablation and surgical interventions; which are accompanied by a higher risk of mortality and complications. There are also increased out-of-pocket costs for the patients associated with these procedures. However, the previously mentioned treatment options are also related with the highest efficacy rate.
Several factors are taken into consideration when recommending treatment options for patients. Antiarrhythmics and rate control options are first line therapies, which are to be used unless the patient fails to have symptomatic relief or suffers greatly from adverse side effects. After failing first line therapies, patients and providers must reflect over which of the second line treatments are most appropriate for said patients. Factors such as efficacy of treatment versus risk of mortality and complications during treatments must be weighed against each other. Long-term outcome, focusing primarily on reoccurrence is especially important. Reoccurrence is particularly characteristic of atrial fibrillation despite various and repeat treatments, and poses a formidable challenge for both patients and providers.

There are opposing opinions on which intervention is considered first line curative treatment for atrial fibrillation. Radiofrequency catheter ablation and the Cox maze III procedure have been forerunners for the past two decades. Both procedures have benefits as well as drawbacks. Catheter ablation has been the favored intervention due to a lower risk of complications associated with treatment and a notable benefit of returning patients to normal sinus rhythm, especially with recent, ongoing technological advances to improve procedural technique (Della Bella et al., 2004). In comparison, the Cox maze III, first performed in 1988, has been used primarily in heart surgery with concomitant procedures. Despite high percentages of success, surgeons have been hesitant to adopt usage of the Cox maze III procedure due to its longer operating times, increased risk of bleeding and due to complexity of the procedure (StopAfib, 2010).

Long-term outcomes of patients with atrial fibrillation treated with the Cox maze III procedure versus radiofrequency catheter ablation have yet to be compared
alongside each other. Although the Cox maze III procedure is known to have higher
cure rates, the question remains unanswered whether the long term benefits of the
procedure outweigh the risk of mortality and complications when there is a safer, lower
risk alternative, namely radiofrequency catheter ablation.

Purpose of the Study

The purpose of this paper is to perform a systematic review of the literature of the
use of the Cox maze III procedure versus radiofrequency catheter ablation for long-term
beneficial outcomes in patients suffering from atrial fibrillation using the Grading of
Recommendations Assessment, Development and Evaluation (GRADE) tool developed
by the GRADE Working Group.

METHOD

An extensive literature search was performed using the Evidence Based
Medicine Reviews Multifile, Medline and CINAHL databases. These databases were
accessed through free online services as well as the Pacific University Library system.
Two separate sets of keywords were searched in the databases with each individual
term as well as in combinations. The first set included: “maze”, “long term” and “atrial
fibrillation”; the second set included the terms: “radiofrequency catheter ablation”, “long
term” and “atrial fibrillation”. Search findings were then filtered to limit them to only
human subjects, the English language, full text articles and articles published since
2000. After the exclusion criteria were applied, the searches yielded 77 and 71 articles,
respectively. Studies not addressing atrial fibrillation as the main and sole diagnosis
were excluded, in addition to studies which did not have radiofrequency catheter
ablation or the Cox maze III procedure as stand alone procedures. This resulted in four studies for the final systematic review – all of which were observational case series.

RESULTS

“Long-term Follow-up After Radiofrequency Catheter Ablation of Atrial Fibrillation: Role of the Acute Procedure Outcome and of the Clinical Presentation”

The first study reviewed was conducted by Della Bella (2004), in Italy, to investigate the results of radiofrequency catheter ablation in patients with atrial fibrillation. Patients who underwent catheter ablation between March 2001 and September 2003, were included in the study. The premise of the study was to observe long-term effects and results of radiofrequency catheter ablation for patients suffering from paroxysmal or persistent atrial fibrillation who had failed pharmacological treatment with at least two agents, including amiodarone. Patients under the age of 50 were exempted from a trial of amiodarone, and the study classified atrial fibrillation as “persistent” if it was present for 60 days despite the use of pharmacological and electrical cardioversion to normal sinus rhythm. Investigative goals were to discover timing of arrhythmia reoccurrence after ablation, the necessity of repeat ablation treatments and the need for anticoagulation or antiarrhythmia therapy after ablation treatment.

For the 234 patients included in the study, 263 radiofrequency catheter ablation procedures were performed. Four of the 234 patients had previous radiofrequency catheter ablation treatments at another institution. Targeted pulmonary vein disconnection was achieved in 236 of the 263 procedures, increasing in percentage in the last year of the study due to improved techniques and practitioners with more
experience. The study found no significant difference in disconnection between the paroxysmal and the persistent atrial fibrillation group – 91% and 86%, respectively. Complications occurred in twenty-six patients ranging in severity from spontaneously resolving pericardial effusion to a cerebrovascular accident. There is no mention of patient mortality.

The authors reported early reoccurrence of atrial fibrillation within seventy-two hours occurring in 62 patients, which was reverted to normal sinus rhythm with pharmacological cardioversion in 19 patients, and electrical cardioversion in 41 patients. Subsequently, the authors performed a Kaplan Meier actuarial analysis to assess statistics for patients in sinus rhythm post catheter ablation treatment, and the results for stable sinus rhythm were 85%, 74%, 72% and 65% at 1, 3, 6, and 12 months, respectively. Seventy-four patients experienced reoccurrences of atrial fibrillation recorded with transtelephonic electrocardiography, emergency room visits with electrocardiography, or routine Holter monitoring. Asymptomatic patients accounted for 17% of the reoccurrence population. Of the seventy-four reoccurrences, fifty-one patients had successful disconnection of all terminated pulmonary veins and thirty-three of these patients underwent a second ablation procedure – atrial fibrillation reoccurred in five of the thirty-three. Three of the patients undergoing the repeat catheter ablation also were noted to have significant pulmonary vein stenosis after the first catheter ablation and required interventional treatment. All patients participating in the study were discharged with anticoagulant and antiarrhythmic therapy, and at one year following discharge, a reported 7% and 29%, respectively, were still taking prescribed medications.
Recommendations from the authors based on study conclusions primarily consisted of the importance of disconnection of all pulmonary veins as the endpoint for radiofrequency catheter ablation. Reoccurrence of atrial fibrillation was noted to have higher frequency in patients who did not have successful disconnection of pulmonary veins. The authors also cite the need for repeat ablation treatments as evidence to prove pulmonary veins are the primary cause of atrial fibrillation, stressing the importance of isolating them. Currently, radiofrequency catheter ablation is done with an electrical mapping guide, instead of being anatomically guided, and the authors are in favor of using anatomically guided radiofrequency catheter ablation suggesting this method will produce better results. Repeat procedures were viewed as a consequence of inherently poor isolation of pulmonary veins. Regular extensive follow-up was also recommended by the authors to catch asymptomatic reoccurrences, due to the high prevalence of asymptomatic atrial fibrillation in their study population.

“Long-term Follow-up After Radiofrequency Catheter Ablation For Atrial Fibrillation”

A study conducted by Katritsis (2008), that focused on the long term outcomes of patients suffering from atrial fibrillation who were treated with radiofrequency catheter ablation. A main distinction made by the study was that the follow up was to extend past three years to provide further long-term clinical information past what was currently available at the time. The primary end-point of the study was whether patients were in normal sinus rhythm or had reverted to atrial fibrillation. Conducted in Virginia, the study evaluated and analyzed a subset of patients who had radiofrequency catheter ablation performed at the authors’ institution, with one or more treatments, that met the required three year minimum follow-up data. These inclusion criteria resulted in 39 patients
patients satisfying the requirements of the study. Results showed 14 patients had one ablation procedure, 19 had two and 6 patients underwent three ablation procedures. Circumferential ablation was performed as a repeat procedure only in 5 of the 6 patients who had a third ablation procedure. Follow-up was done every month for one year after the most recent ablation treatment, and every three months thereafter. Holter-monitoring, transtelephonic electrocardiograms and routine physical exams were required from all patients as follow up protocol. Primary end points and the three year minimum follow-up were assessed after the most recent radiofrequency catheter ablation.

After the initial procedure, 36 patients of the 39 that participated, developed atrial fibrillation within 3-42 months. Reoccurrences after 12 months of follow-up consisted of 56% of the patient study population. Twenty-five of the thirty-six patients elected to have a secondary ablation procedure done, and fifteen of those patients developed a second reoccurrence of atrial fibrillation. Only 6 of those 15 elected to have a third procedure done, and two of the six patients had a third reoccurrence of atrial fibrillation at 10 and 12 months following catheter ablation. With the exception of a pericardial effusion, no other complications occurred secondary to the catheter ablation treatment. At the end of the thirty six month follow up, only 17 patients of the 36 were not suffering from atrial fibrillation. The percentages of patients free from atrial fibrillation after one ablation treatment were: 93%, 43%, 28% and 21% at 12, 15, 18 and 24 months post treatment, respectively. Patients at the end of follow up, without accounting for the number of ablation treatments, had atrial fibrillation free percentages of: 92%, 73%, 42% and 35% at 6, 12, 18 and 24 months, respectively.
Recommendations from the authors consisted of primarily vigorous follow-up procedures with transtelephonic monitoring and other evaluations to find asymptomatic individuals with atrial fibrillation. Approximately 50% of patients were noted to be asymptomatic during an episode of atrial fibrillation and the authors note that transtelephonic monitoring decreases atrial fibrillation free rates by 15% at three months (Katritsis et al., 2008). The authors also mentioned the difference between ostial, antral and circumferential radiofrequency catheter ablation techniques and recommended antral and circumferential over ostial technique.

“The Cox maze III Procedure For Atrial Fibrillation: Long-term Efficacy in Patients Undergoing Lone Versus Concomitant Procedures”

This study was performed by Prasad (2003) to assess patients for long-term outcomes after having the Cox maze III procedure done for lone atrial fibrillation or atrial fibrillation with concomitant heart disease. The study examined 198 patients who underwent the Cox maze III procedure from January 1988 to January 2002. Of the 198 patients, 112 patients had lone atrial fibrillation and 86 patients had the maze procedure as a concomitant procedure. Dr. James Cox himself performed 158 of these surgeries.

Follow-up included reviewing the referring cardiologists’ office visit notes and electrocardiograms for patients who stated they were in atrial fibrillation. Information was gathered from family members for patients who were deceased during follow-up. Lone atrial fibrillation patients proceeded with surgery due to a past medical history of cerebrovascular accidents, medication intolerance or arrhythmia intolerance. Concomitant atrial fibrillation patients had the highest association with mitral valve repair/replacement or coronary artery bypass grafting. There were 12 perioperative
complications in both subject groups, with one death in the concomitant group. Follow-up ranged from 1.4 to 8.4 years and late follow-up was accomplished in 177 patients. There were three late deaths in the lone maze group, and 7 late deaths in the concomitant maze group, however all ten patients had medical documentation showing they were in normal sinus rhythm at their last medical visit before their passing. Of the 98 patients in the lone maze group, 78 of them were in normal sinus rhythm and off antiarrhythmia medications, leaving 20 remaining patients requiring daily antiarrhythmia medication. Four of the patients in the lone maze group reported being in atrial fibrillation themselves. In the concomitant group, 2 patients of the 79 were in atrial fibrillation, 58 were in normal sinus rhythm without medication and the remaining 19 required medication to stay in sinus rhythm.

Outcomes of the study prompted the authors to recommend the Cox maze III procedure for patients with lone atrial fibrillation in addition to patients undergoing concomitant procedures. The authors surmise that given the options available to patients with lone atrial fibrillation, the Cox maze III procedure should be recommended because it gives patients greater than a 95% chance of a long-term cure with a low mortality rate (Prasad et al., 2003). Patients with concomitant disease were also recommended by the authors to undergo the Cox maze III for atrial fibrillation since their findings showed the same long-term benefit as the lone group, with longer hospital stays, but without increased perioperative mortality (Prasad et al., 2003).

“Favorable Long-term Outcome of Maze Surgery in Patients With Lone Atrial Fibrillation”
A study conducted in the Netherlands by Hemels (2006) which examined patients who underwent the Cox maze III procedure for lone atrial fibrillation from February 1995 to February 2004. Twenty-nine patients were included in the study that were below 60 years of age and did not have either underlying heart disease or sinus node dysfunction. Antiarrhythmic drugs had not proven successful for these patients who were highly symptomatic from their atrial fibrillation. Success was defined as being free from atrial fibrillation and antiarrhythmics beyond three months post operatively.

Follow-up consisted of patients visiting the outpatient clinic at 1, 3, 6, and 12 months post operatively, with annual visits thereafter. Holter-monitoring, electrocardiograms and stress testing were all done at these follow-up visits. Quality of life was also assessed using the Medical Outcomes Study Short Form Health Survey. Of the 29 patients, one patient passed 5 years post operatively due to colon cancer. Otherwise, no other patients were lost to follow-up. Of the 29 patients, 23 were free of atrial fibrillation and antiarrhythmic usage. Two patients were in normal sinus rhythm with antiarrhythmic usage, and the four remaining patients had unsuccessful outcomes from the Cox maze III procedure. Of the four, two patients were still symptomatic and suffering from paroxysmal atrial fibrillation, one had permanent atrial fibrillation, and the other required a pacemaker implantation. All patients were free from atrial fibrillation after two years of follow up. A total of four patients received a pacemaker to remain in normal sinus rhythm. Quality of life was assessed with the SF-36 questionnaire and no difference between the 27 patients who completed the survey post operatively and the healthy control subjects was noted. Severe complications occurred in 5 patients due to
the operation, and another 2 patients received a pacemaker due to sinus node
dysfunction post-operatively.

After the conclusion of the study, authors recommended the Cox maze III as a
promising treatment for atrial fibrillation given that 86% of their patients were atrial
fibrillation free after a mean of 4.8 years with only 2 patients on antiarrhythmia
medication (Hemels et al., 2006). Additionally, the authors question the efficacy of
transcatheter ablation in comparison to the Cox maze III, and note there is insufficient
long-term evidence to compare with the Cox maze III. Complications from the procedure
were noted in 16% of patients with no deaths observed, were stated to fuel the authors’
suggestions for increased usage of the Cox maze III despite the stated bias of current
practicing physicians.

DISCUSSION

Atrial fibrillation is a prevalent medical condition, impacting the lives of millions of
Americans. Arrhythmias, in general, pose a daily challenge for patients affecting their
overall sense of well being and placing them at an increased risk for other secondary
complications. Finding the optimum treatment for each patient as an individual, is vital to
their psychological and physiological health. The symptoms associated with atrial
fibrillation have an extreme negative impact on patients’ daily lives, and subsequently
their happiness with their quality of life.

The first study reviewed: “Long-term follow-up after radiofrequency catheter
ablation of atrial fibrillation: Role of the acute procedure outcome and of the clinical
presentation”, observed that at 12 months of follow up after radiofrequency catheter
ablation, 65% of patients were in stable sinus rhythm (Della Bella et al., 2004). Although
more than half of the patients treated in the study remained in sinus rhythm after 12 months, 29% of the patient group were taking antiarrhythmic medication at 12 months (Della Bella et al., 2004). Also, a stable decrease in efficacy percentages of patients in normal sinus rhythm was noted over time. A longer follow-up time frame would have allowed for a more accurate measurement of efficacy of treatment.

The second study reviewed for radiofrequency catheter ablation was: “Long-term follow-up after radiofrequency catheter ablation for atrial fibrillation”, which observed a smaller group of patients undergoing catheter ablation with a minimum three year follow-up from the last treatment. At the end of follow up, roughly 43% of patients were in sinus rhythm, however 76% of patients analyzed had more than one catheter ablation treatment (Katritsis et al., 2008). The calculated long term success rate of one ablation treatment with complete disconnection of pulmonary veins was 21%, which meant that according to Katritsis, less than one quarter of the patients undergoing one ablation had long term benefit. Decreased efficacy of radiofrequency catheter ablation was seen in this study possibly due to the longer follow-up period.

Overall, both studies showed long term benefits of curing atrial fibrillation with radiofrequency catheter ablation most likely required multiple procedures resulting with about half of patients being atrial fibrillation free. Both studies also stated if patients were not in sinus rhythm, they at least had symptomatic improvement. Complications were limited to artero-venous fistulas, pulmonary vein stenosis, venous thrombosis, a cerebellar stroke, pericardial effusions and cardiac tamponade. No mortalities were recorded.
Limitations of the first study were the shorter follow-up period of 12 months and the fact that more than half of the patients with atrial fibrillation reoccurrence declined a second ablation procedure. Consequently, less data was acquired for the efficacy of repeat catheter ablation treatments and the frequency of pulmonary vein stenosis as a complication of radiofrequency catheter ablation (Della Bella et al., 2004). The second study’s most prominent limitation was the sample size (Katritsis et al., 2008). Thirty nine patients were included for the study who met the criteria of three year follow-up. Although the data provided was excellent to investigate long term effects of radiofrequency catheter ablation, a small patient group does not warrant confidence.

“The Cox maze III procedure for atrial fibrillation: Long-term efficacy in patients undergoing lone versus concomitant procedures” examined patients with lone atrial fibrillation versus other cardiac disease and found after undergoing the Cox maze III, 96% of patients were free of atrial fibrillation, with 18% of patients on medications (Prasad et al., 2003). Surprisingly, there was no significant difference between the two groups, and operative mortality was under 2% for both. Late follow-up was accomplished in most of the 198 patients.

“Favorable long-term outcome of Maze surgery in patients with lone atrial fibrillation” demonstrated that 79% of patients were free of atrial fibrillation and medications years after undergoing the Cox maze III and only 7% of patients needed to take medication to remain in normal sinus rhythm (Hemels et al., 2006). Complications mainly consisted of the need for pacemaker placement in 14% of patients due to a sinus node dysfunction or recurrent atrial fibrillation, however, there was no mortality noted due to the procedure itself.
Outcomes of the two studies are indicative that the majority of patients are free of atrial fibrillation post Cox maze III surgery, with a small subset requiring antiarrhythmia prescriptions. Including patients on prescription medication, the Cox maze III cure rate is in the 90th percentile, and mortality due to the procedure itself is between 1 and 2%. These figures stated in the previously mentioned studies show promising results and suggest further research on the Cox maze III procedure is required.

Limitations of the first study were primarily the leniency of follow-up procedures in regards to monitoring sinus rhythm (Prasad et al., 2003). Patients could have possibly had episodes of atrial fibrillation without symptoms and there would be no documentation of the arrhythmia since follow-up depended mainly on patient reporting. The second study was limited again by patient population size as only 29 patients were included for the final analysis of treatment (Hemels et al., 2006).

All four studies were examined for quality using the GRADE working tool which was created in 2000 by a group of individuals who aimed to improve current grading systems in healthcare by grading quality of evidence and strength of recommendation (GRADE Working Group, n.d.). The GRADE table below, compares the intervention of the Cox maze III procedure versus radiofrequency catheter ablation for the treatment of atrial fibrillation. Two outcomes are measured for the rate of reoccurrence, after either procedure, and the usage of antiarrhythmics post treatment. All four case series addressed the first outcome and only three addressed the second.

GRADE examines outcomes based on the quality of evidence provided by the studies assessing various factors including: evidence type, study quality, consistency, precision, publication bias, confounders, large magnitude and dose-response. The
overall GRADE of evidence is rated from very low to very high based on the starting study quality, which determined by evidence type, and then is mediated by the previously mentioned factors. Medical recommendations are based on the strength of evidence ranging from strong and weak recommendations (GRADE Working Group, n.d.). The first outcome, reoccurrence of atrial fibrillation, had four case series as evidence, and although none of the case series evaluated the Cox maze III procedure directly against radiofrequency catheter ablation directly, the outcome can be determined by evaluating each study individually. Case series automatically start out at a low GRADE due to the nature of the study that lacks double blinding of patients and physicians involved, in addition to randomization of patients in a therapeutic and a control group. The study quality was low, as expected for all four cases, with consistency and precision being unremarkable. Dose-response was not measured in the studies, and although two of the studies had small patient populations, the other two had large patient groups they evaluated for this specific type of intervention. The second outcome, use of antiarrhythmics after treatment, was supported by three of the four studies. Again this was a secondary outcome of each of the three studies, and there was no evidence of anything that would have lowered or raised study quality. Overall, the studies started at low, and remained at low quality for evidence.

Despite the overwhelming evidence of the efficacy of the Cox maze III procedure, due to the low quality of evidence as per GRADE, the studies would not be sufficient to strongly recommend the Cox maze III procedure over radiofrequency catheter ablation for the treatment of atrial fibrillation. Nevertheless, the preliminary, low quality evidence appears to be quite promising for future studies. The Cox maze III procedure provides a
cure for atrial fibrillation, without reoccurrence in the long term and minimal to no antiarrhythmia medication usage post operatively. Mortality risk is somewhat higher, yet multiple treatments with radiofrequency catheter ablation are also associated with notable complications (cardiac tamponade, CVA, etc.) and long-term damage, i.e. pulmonary vein stenosis. Radiofrequency catheter ablation has also shown to have lower efficacy rates as time progresses after each treatment, therefore, showing the need to have multiple treatments for a sub par cure rate. Patients should be evaluated individually for specific needs, operative risk, level of symptomatic impact on their daily lives, and comfort level with invasive treatment, but despite personal choice for treatment modality, the Cox maze III procedure appears to be a promising curative treatment for the future. Depending on future research, including studies with larger sample sizes, longer follow-up time frames and more controls, a strong medical recommendation may be in store for the Cox maze III procedure.
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http://www.stopafib.org/maze-surgery.cfm
### APPENDIX

#### Table 1: GRADE Table

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Outcome</th>
<th>Quantity and type of evidence</th>
<th>Findings</th>
<th>Decrease GRADE</th>
<th>Increase GRADE</th>
<th>Grade of Evidence for Outcome</th>
<th>Overall GRADE of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox Maze III procedure v.s. radiofrequency catheter ablation</td>
<td>Reoccurrence of atrial fibrillation</td>
<td>4 case series</td>
<td>Cox Maze III had decreased reoccurrence of atrial fibrillation</td>
<td>Low</td>
<td></td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Subsequent antiarrhythmic usage</td>
<td></td>
<td>3 case series</td>
<td>Decreased rates of antiarrhythmic prescription usage to remain in NSR in Cox Maze III pts</td>
<td>Low</td>
<td></td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>