SciForschen
Open HUB for Scientific Research

ISSN 2470-0991

Journal of Surgery: Open Access

Mini Review | Volume: 3.2 | Open Access

Surgical Closure of the Left Atrial Appendage. Basal Considerations before attempting with Occluder Devices

Ovidio A Garcia-Villarreal*

Department of Cardiovascular Surgery, Hospital Zambrano Hellion, Monterrey, Mexico

***Corresponding author:** Ovidio A Garcia-Villarreal, Department of Cardiovascular Surgery, Hospital Zambrano Hellion, Monterrey, Sierra Nayarita 143, Col. Virginia Tafich, 66374, Santa Catarina, Nuevo Leon, Mexico, **E-mail:** ovidiocardiotor@gmail.com

Received date: 22 Dec 2016; **Accepted date:** 23 Feb 2017; **Published date:** 01 Mar 2017.

Citation: Garcia-Villarreal OA (2017) Surgical Closure of the Left Atrial Appendage. Basal Considerations before attempting with Occluder Devices. J Surg Open Access 3(2): doi http://dx.doi.org/10.16966/2470-0991.144

Abstract

Despite a lot of publications in favor of left atrial appendage occlusion, basal considerations regarding the closure of the left atrial appendage seem to be missed. Surgical closure of the left atrial appendage is the most direct method to analyze all the most common arising contingencies. The most effective method to achieve a successful left atrial appendage closure is surgical "cut-and-sew" with total removal of the left atrial appendage. Surgical suture exclusion and stapler exclusion show 23% and 0% of success rate, respectively. A high percentage of patients with suture exclusion have persistent flow into the appendage documented by color Doppler (60%), and a high percentage of those with stapler exclusion exhibit a persistent left atrial appendage stump >1 cm (58%). Incomplete closure of the left atrial appendage is an independent predictor of stroke or systemic embolism, and the stroke risk is 5-fold higher than expected. All these data may have important implications for cardiologists regarding left atrial appendages occluder devices.

Keywords: Atrial fibrillation; Left atrial appendage; Left atrium

There is a large amount of material available in the literature regarding left atrial appendage (LAA) as the main emboli gen source of the heart in patients having any type of atrial fibrillation (AF). In fact, 91% of the thrombin patients with non-rheumatic AF and 57% with rheumatic AF arise from the left atrial appendage [1]. It has been suggested the prophylactic LAA removal whenever the chest is open in order to prevent future strokes [2]. Current 2016 guidelines for treatment of AF point out that surgical occlusion or exclusion of the LAA may be considered for stroke prevention in patients with AF undergoing cardiac surgery. In addition, the authors stated that residual LAA flow or incomplete LAA exclusion can increase stroke risk [3].

Prior to the issue of the LAA occluder devices, special attention must be paid in LAA surgical exclusion. The first question is what method is the best one to get success. Several surgical techniques have been used in order to exclude the LAA. There are two basic techniques: exclusion and removal, each one of them with some variations. Kanderian et al. [4] studied 137 patients underwent surgical LAA closure with transesophageal echocardiography after surgery. Thirty-eight percent underwent excision, either by scissors or an amputating stapling device; and 62% underwent exclusion (inner suture or external stapler leaving LAA *in situ*). The most effective method to achieve success was the excision showing 73% of success rate, followed by suture exclusion (23%), and stapler exclusion (0%). However, as a whole group, only 40% for successful LAA closure was obtained. What does it mean? The most effective method to achieve a successful LAA closure is surgical "cut-and-sew" with total removal of the LAA. Moreover, looking carefully for the error sources in the group of surgical excision, remnant LAA causes 27% for failure. Remnant LAA is defined as a residual stump or pouch remaining in the LAA >1 cm in maximum length after closure. Surrounding area of the LAA base is friable and thin with fat pad containing the circumflex coronary artery. Several extremely thin areas of atrial wall are located at the base of the LAA [5]. Fears of heart disruption, difficult exposure from outside of the heart are some of the most dreaded complications by a cardiac surgeon. A good surgical exposure is usually obtained by adequate selection of the approach. Garcia-Villarreal has described a hands-free approach for LAA in order to avoid all these complications [6].

On the other hand, exclusion of the LAA is performed by closing the orifice into the LA cavity while remaining attached to this one. This technique is performed by various methods of suturing (running suture, purse string or external ligation) or by stapling. Although these surgical techniques are simple to apply, there is uncertainty regarding their reproducibility and effectiveness. In the article by Kanderian et al. [1], 5.8% showed patent LAA (excision, 0%; suture exclusion, 8%; stapler exclusion, 17%), remnant LAA, 20% (excision, 27%; suture exclusion, 8%; stapler exclusion, 58%), excluded LAA with persistent flow, 34% (excision, 0%; suture exclusion, 61%; stapler exclusion, 25%), and a successful LAA closure, 40% (excision, 73%; suture exclusion 23%; stapler exclusion, 0%). Noteworthy, a high percentage of patients with suture exclusion of the LAA had persistent flow into the appendage documented by color Doppler from the LA and the LAA (60%), and a high percentage of those with stapler exclusion had a persistent LAA stump >1 cm (58%). LAA partially closed is more likely to thrombose because of higher blood stasis. In fact, the prevalence of LAA thrombus in appendages with the persistent flow was high in this study (46% in suture exclusion and 67% in stapler exclusion). Such a summary, therefore, has important implications for both cardiologists and surgeons. For the less-invasive procedures in which most surgeons are likely to use either suture or stapler for LAA exclusion, this study presents clear evidence of the inadequacy of these techniques. The only safe method to achieve a complete surgical closure of the LAA is excision (with scissors or stapler). The other ones need to be reviewed, improved and maybe avoided.

Similar results have found by Schneider et al. [7]. They studied 6 consecutive patients with paroxysmal (n=3) or permanent (n=3) atrial fibrillation who underwent surgical LAA closure at the time of valve surgery. At a large follow-up (mean 51 months), complete LAA closure was observed in only 1 patient. Five incomplete LAA closures were found due to disruption of the closure line. The spontaneous echocardiographic contrast in the LAA had newly developed (n=3) or was much more intense than preoperatively (n=2), resulting in blood stagnation and an increased likelihood of clot formation. Incomplete surgical LAA closure may promote rather than reduce the risk of stroke. Indeed, incomplete closure of the LAA is an independent predictor of stroke or systemic embolism in univariate analyses. Aryana et al. [8] have studied the association between incomplete surgical ligation of LAA and stroke/systemic embolization. In this study on 72 patients, those with stroke and systemic embolization and incomplete surgical ligation of the LAA exhibited a significantly smaller neck diameter (2.8 ± 1.0 *vs* 7.1 ± 2.1 mm; P=0.002). In this setting, the annualized stroke and systemic embolization risk were 6.5%, increasing up to 14.4% while not receiving oral anticoagulation, and 19.0% in those cases with neck diameter ≤5.0 mm, per 100 patient-years of follow-up. Stroke risk was 5-fold higher than expected.

Mild periprosthetic leakage after LAA closure with catheter-based techniques has been observed up to 16.2% in a 6-month follow-up by transesophageal echocardiography [9]. Despite the fact that several studies have suggested the benign course of this complication [10-12], because of the short-term duration of these studies, there is a lack of evidence about the real long-term impact. Long-term follow-up is mandatory to properly validate the effect of peri-device leakage after LAA closure with occluder devices.

All these considerations play an important role in the field of LAA occlusion or exclusion. At the same time, it acts as a starting point for future studies and specifically to open debate on the conditions and requirements focused on LAA occluder devices.

References

1. Blackshear JL, Odell JA (1996) Appendage obliteration to reduce stroke in cardiac surgical patients with atrial fibrillation. Ann Thorac Surg 61: 755-759.
2. Johnson WD, Ganjoo AK, Stone CD, Srivyas RC, Howard M (2000) The left atrial appendage: our most lethal human attachment! Surgical implications. Eur J Cardiothorac Surg 17: 718-722.
3. Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, et al. (2016) 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur Heart J 37: 2893-2962.
4. Kanderian AS, Gillinov AM, Petterson GB, Blackstone E, Klein AL (2008) Success of surgical left atrial appendage closure. Assessment by transesophageal echocardiography. J Am Coll Cardiol 52: 924-929.
5. Su P, McCarthy KP, Ho SY (2008) Occluding the left atrial appendage: anatomical considerations. Heart 94: 1166-1670.
6. Garcia-Villarreal OA (2014) Hands-free approach for the left atrial appendage in Cox maze IV. Asian Cardiovasc Thorac Ann 22: 1141-1143.
7. Schneider B, Stollberger C, Sievers HH (2005) Surgical closure of the left atrial appendage - a beneficial procedure? Cardiology 104: 127-132.
8. Aryana A, Singh SK, Singh SM, O'Neill PG, Bowers MR, et al. (2015) Association between incomplete surgical ligation of left atrial appendage and stroke and systemic embolization. Heart Rhythm 12: 1431-1437.
9. Urena M, Rodés-Cabau J, Freixa X, Saw J, Webb JG, et al. (2013) Percutaneous left atrial appendage closure with the AMPLATZER cardiac plug device in patients with nonvalvular atrial fibrillation and contraindications to anticoagulation therapy. J Am Coll Cardiol 62: 96-102.
10. Viles-Gonzalez JF, Kar S, Douglas P, Dukkipati S, Feldman T, et al. (2012) The clinical impact of incomplete left atrial appendage closure with the Watchman device in patients with atrial fibrillation: a PROTECT AF (percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation) substudy. J Am Coll Cardiol 59: 923-929.
11. Bayard YL, Omran H, Neuzil P, Thuesen L, Pichler M, et al. (2010) PLAATO (percutaneous left atrial appendage transcatheter occlusion) for prevention of cardioembolic stroke in non-anticoagulation eligible atrial fibrillation patients: results from the European PLAATO study. EuroIntervention 6: 220-226.
12. Freixa X, Tzikas A, Sobrino A, Chan J, Basmadjian AJ, et al. (2013) Left atrial appendage closure with the Amplatzer™ Cardiac Plug: impact of shape and device sizing on follow-up leaks. Int J Cardiol 168: 1023-1027.