



*How to do it? / Nasıl yapılır?*

## Pericardial patch closure of left atrial appendage orifice

*Sol atriyum apendiks orifisinin perikard yama ile kapatılması*

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### ABSTRACT

Seven patients underwent pericardial patch closure of the left atrial appendage orifice in our clinic. Usually 5-to-7 U-sutures with 4-0 prolene were placed to the left atrial appendage orifice. These sutures were stretched out to measure exact sizes of the left atrial appendage orifice. Then, U-sutures were passed through the pericardial patch which was treated with glutaraldehyde. Pericardium was placed over the left atrial appendage orifice through the left atrium and stay sutures were tied. The upper suture was continuously sutured along the border of the orifice clockwise and tied to the lower suture. The lower suture was continuously sutured in a counter-clockwise direction and tied to the upper suture. Then, mitral valve surgery (repair or replacement) was performed.

**Keywords:** Exclusion; left atrial appendage; pericardial closure.

Atrial fibrillation (AF) is the most common cardiac arrhythmia with rising prevalence. Approximately 35% of AF patients have a stroke during their life. Stroke is one of the leading causes of mortality and morbidity after cardiac surgery. Stroke mostly results from cardiac embolism in patients with AF.<sup>[1]</sup> Studies have shown that more than 90% of atrial clots originate from the left atrial appendage (LAA).<sup>[2]</sup> Johnson et al.,<sup>[3]</sup> named LAA as the most lethal human attachment. Many cardiac surgeons performed LAA resection or obliteration during mitral valve surgery.<sup>[4-6]</sup> Several techniques have been produced for LAA surgery. Many surgeons have performed the LAA closure through the left atrium during mitral valve surgery rather than LAA resection.<sup>[6]</sup> Schneider et al.,<sup>[5]</sup> reported a high rate of recurrence and recanalization after suturing LAA orifice through the left atrium. Kanderian et al.,<sup>[7]</sup> reported that surgical resection of LAA was the most

### ÖZ

Kliniğimizde yedi hastada sol atriyal apendiks orifisi perikard yama ile kapatıldı. Genellikle 4-0 prolene ile 5-7 askı sütürü sol atriyal apendiks orifisine konuldu. Bu sütürler gerilerek orifisin gerçek boyutları ortaya çıkartıldı. Ardından askı sütürleri glutaraldehit ile muamele edilmiş perikard yamasından geçildi. Perikard sol atriyumdan sol atriyal apendiks orifisi üzerine yerleştirildi ve geçici sütürler bağlandı. Orifisin üst sınırı saat yönünde devamlı sütürler ile kapatıldı ve alt suture bağlandı. Alt sınırı ise, saat yönünün aksi yönünde devamlı sütürler ile kapatıldı ve üst suture bağlandı. Daha sonra mitral kapak cerrahisi (tamir veya replasman) uygulandı.

**Anahtar sözcükler:** Eksklüzyon; sol atriyum apendiks; perikard kapama.

successful technique. In our clinic, we perform LAA resection during mitral valve surgery. However, LAA resection may be difficult or sometimes impossible due to dense adhesions, particularly in redo valve surgery. Herein, we used a different technique using U-sutures and pericardial patch for closure of LAA orifice during mitral valve surgery.

### SURGICAL TECHNIQUE

A written informed consent was obtained from each patient. Extended left atriotomy incision was used for all patients. The LAA orifice borders were carefully inspected before mitral valve surgery. Usually 5-to-7 U-sutures with 4-0 prolene were placed to the LAA orifice (Figure 1a). These sutures were stretched out to measure exact sizes of the LAA orifice. Then, U-sutures were passed through the pericardial patch which was treated with glutaraldehyde. We placed

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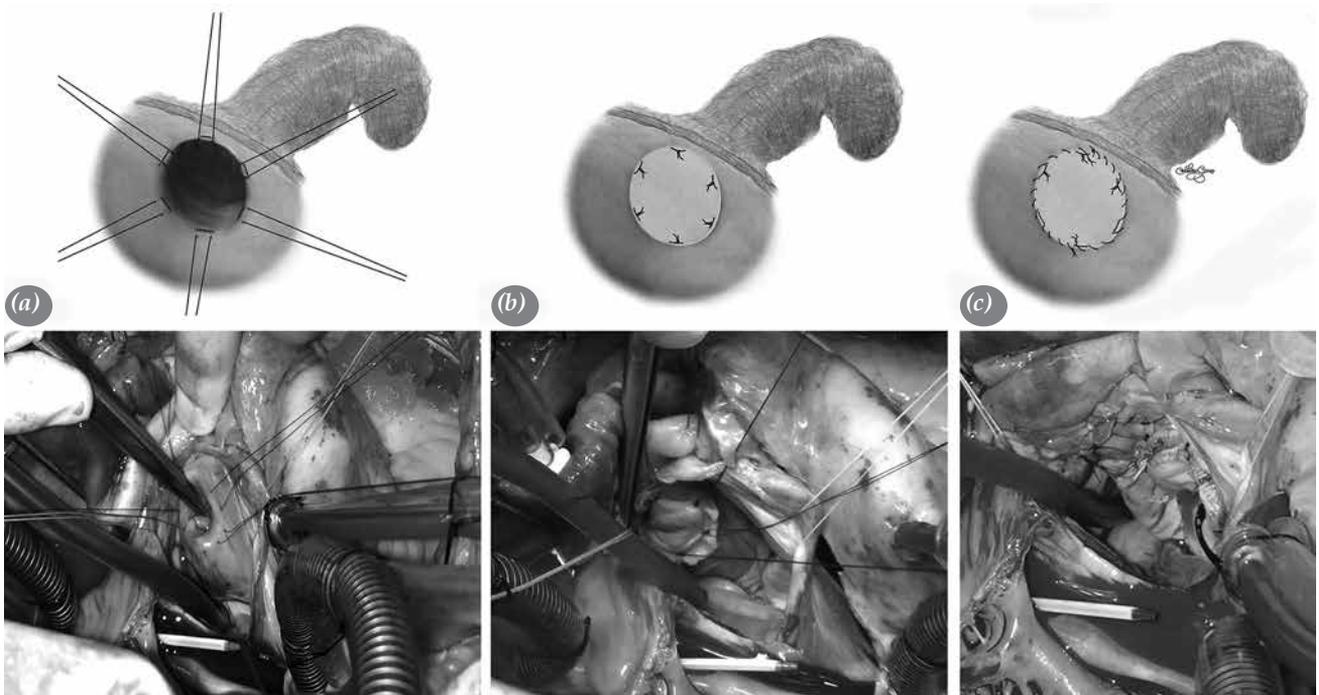
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**Figure 1.** (a) Prolene stay U-sutures were placed around the LAA orifice and stretched out to obtain real diameter. (b) All sutures were passed through the appropriately trimmed and treated pericardial patch. The patch were placed onto the LAA orifice and sutures were tied. (c) Upper suture was continuously sutured along the border of the LAA orifice clockwise and tied to the lower suture. The lower suture was continuously sutured in a counter-clockwise direction and tied to upper suture.

LAA: Left atrial appendage.

the pericardial patch with the smooth side facing the left atrial chamber to avoid the coarse side to contact with the blood flow and serve as a nidus for blood clot formation. Bovine pericardium was used, when autologous pericardium was not available. Usually a 15×12-mm size oval-shaped pericardium was used. Pericardium was placed over the LAA orifice through the left atrium, sutured, and tied (Figure 1b). The upper suture was continuously sutured along the border of the LAA orifice clockwise and tied to the lower suture. The lower suture was continuously sutured clockwise and tied to the upper suture (Figure 1c). Then, mitral valve surgery (repair or replacement) was performed.

## DISCUSSION

Kanderian et al.,<sup>[7]</sup> study has proved the importance of LAA resection to avoid postoperative stroke. High recurrence and recanalization rate are the major drawbacks of many exclusion (suturing) techniques. With suture exclusion technique, incomplete LAA occlusion has been reported in 10 to 73% of the cases.<sup>[7]</sup> In particular, dilated left atrium is a strong predictor of recurrence for exclusion techniques. Left atrial distension may tear sutures off the

adjacent left atrial tissue. Despite these high rates of recurrence, many surgeons still avoid LAA resection due to the fragility of the tissue and the proximity of surrounding structures. Autologous pericardium strips or Teflon felts were used by many surgeons for LAA atriotomy closure to avoid bleeding. Pericardial closure technique was initially described in cadaveric heart study.<sup>[8]</sup> Malakouti-Nejad et al.,<sup>[8]</sup> directly closed by pericardium without measurement of the LAA orifice size by continuous suture. We placed 5-to-7 stay sutures and, then, these stay sutures were stretched to obtain the exact size of the LAA orifice. We were inspired by their technique and made these small modifications.

When pericardium was adherent to the surrounding LAA tissue, extensive dissection may be required for LAA resection. Sometimes, dissection of LAA from the surrounding tissue was impossible due to dense adhesions. We used the described technique in seven patients. We believe that using the correct size of the pericardial patch is crucial. A too small pericardial patch on the LAA orifice may produce excessive stress on suture lines, when the left atrium is fully distended after surgery, so suture disruption may

occur. We meticulously measured the LAA orifice by stretching U-sutures in different directions to ensure that the appropriate size of the pericardial patch was used for each patient. We found no blood flow through the LAA after the pericardial patch closure technique. After a two-year follow-up period, we observed no stroke or transient ischemic attack in any of seven patients. We suggest that LAA resection is the most optimal surgical technique for LAA elimination. When LAA resection is unable to be done, pericardial closure technique can be used rather than other exclusion surgeries. We also would like to emphasize that pericardial closure technique can be only used in patients with discrete LAA borders in the left atrium. Some patients have a wide LAA orifice and obscure borders which makes pericardial patch closure through the left atrium impossible. However, major limitation of our technique is that it requires bovine pericardium which adds an additional cost, although bovine pericardium provides tensionless closure of the LAA orifice.

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