Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Surgery

Minimally Invasive Right Thoracotomy Approach for Atrial Septal Defect Closure: Report of the First Case Performed in Burkina Faso

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DOI: https://doi.org/10.36347/sjmcr.2025.v13i04.026 | **Received:** 12.03.2025 | **Accepted:** 16.04.2025 | **Published:** 22.04.2025

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Abstract **Case Report**

Atrial septal defect (ASD) is a hole in the wall that divides the upper chambers of the heart. It may close spontaneously or require closure. Historical approach was operative closure by a full sternotomy. Currently, the gold standard approach is the device closure. When this approach is not available or is not indicated, the alternative is the minimally invasive approaches. In Burkina Faso, West Africa, ASD closure has been performed since 2021 by sternotomy. The authors report the first experience ever of minimally invasive cardiac surgery. A right mini thoracotomy was successfully used as an approach to close secundum atrial septal defect in a four-year old boy. Thoracic wall muscles were spared. The team did not face any technical issue during the procedure and so did not convert to a full sternotomy. Cross clamping time was 23 minutes and CPB lasted 40 minutes. Postoperative course was uneventful, and the patient discharged on day five.

Keywords: Minimally Invasive Cardiac Surgery, Atrial Septal Defect, Congenital Heart Disease, Burkina Faso.

BACKGROUND

Atrial septal defect (ASD) is a hole in the wall (septum) that divides the upper chambers (atria) of the heart. It occurs when the septum does not form properly during pregnancy [1]. It is one of the commonest left-to-right shunt particularly in the infants. The defect can vary in size and may close on its own or require closure. Historically, the closure was performed surgically by full sternotomy. Over the decades, the approach has been evolved; the percutaneous device is currently the gold standard treatment in infants with secundum defects [2]. However, due to insufficient margins or the large size of the defect, surgical closure is required in these situations. The surgical approaches are evolving to minimally invasive techniques [3]. In Burkina Faso, in West Africa, open heart surgery has started in 2021 by a surgical closure of secundum ASD in a 14-year old girl. Since then, all the cases of ASD are being operatively closed by a median sternotomy with fresh autologous pericardium, heterologous bovin patch or GoreTex® patch [4]. In this paper, the authors report the first minimally invasive approach for ASD at the university hospital of Tengandogo, Burkina Faso in August 2024.

CASE PRESENTATION

CB was a four-years old boy, 12 kilograms of weight with a previous history of repetitive respiratory infections that needed hospitalization many times in pediatrics. Then he was sent to pediatric cardiology where he was diagnosed with secundum ASD. The size was 18 mm; the shunt was left-to-right and there was dilatation of the right chambers. Pulmonary arterial mean pressure was 45 mmHg. Left ventricular ejection fraction was 75%. The electrocardiogram has confirmed the dilated right atrium and right ventricle and there was no rhythm disturbance. In the chest X-ray, the pleura and lungs were normal. The lab tests showed no abnormality. Human immunodeficiency virus, hepatitis B and C virus tests were all negative. Then an indication to close the ASD was made by our staff. Due to inexistant percutaneous device closure in the center, the decision to surgically close the defect through a minimally invasive right thoracotomy was made. Anesthetic procedure

included general anesthesia with peripheral venous line, a central venous line in the right jugular vein, right femoral arterial line and esophageal thermal probe. The patient was installed on left lateral decubitus position with a roll under the thorax (Figure 1). A vertical 5-cm incision was done on the right mid-axillary line centered on the fourth intercostal space. The thoracic wall muscles were spared and two pediatric Finochietto rib spreader were used to expose the right pleural space (Figure 2). Then the right lung was retracted posteriorly. The pericardium was open anteriorly to phrenic nerve and then exposed with 2.0 polyester suture. Arterial cannulation for cardiopulmonary bypass was done at the ascending aorta; the veinous cannulas were consecutively inserted in the superior and inferior vena cava. Both venae cava were snared; cross clamping with a De Bakey straight clamp and modified del Nido solution was used for cardioplegia. Right atriotomy showing a central defect that was closed with a bovine pericardium by a 5.0 polypropylene running suture (Figure 3). After closing the right atrium and de-airing of the left chambers, the cross clamp was released and heartbeats have started spontaneously by sinus rhythm. Cross clamping time was 23 minutes and CPB lasted 40 minutes. A chest tube was introduced into the pericardium and the right pleura (figure 4). One-hour fast track extubation protocol was done. Postoperative course was uneventful; he stayed in the cardiac ICU for two days and then he discharged on postoperative day seven.

Figure 1: patient installed on left lateral decubitus

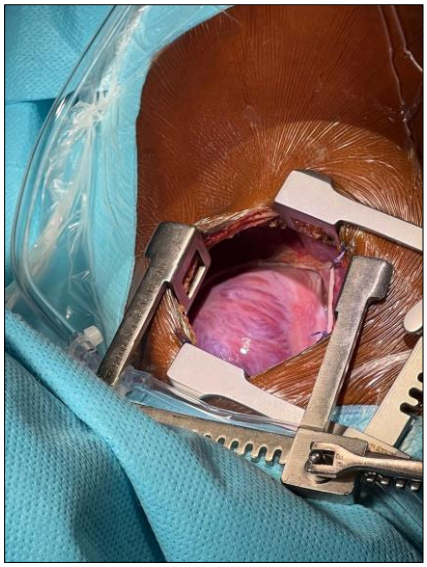

Figure 2: thoracotomy exposure by two Finochietto rib spreader

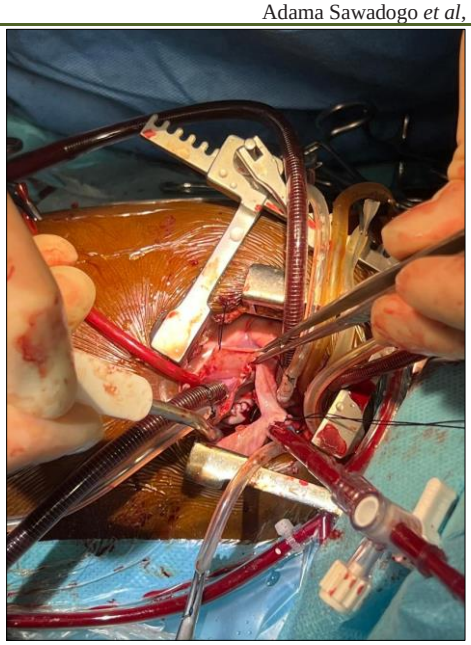

Figure 3: defect closure by bovine pericardial patch

Figure 4: aspect of the incision after skin closing

DISCUSSION

So far in the university hospital of Tengandogo, the only center to perform cardiac surgery and interventional cardiology in Burkina Faso there is no device closure of ASD. In this report the authors described the first case ever of minimally invasive approach in cardiac surgery in the country. Percutaneous closure is the current indication for the treatment of secundum ASD in infants. It provides many advantages that include less postoperative pain, absence of skin scar and shorter hospital stay. However, in the absence of percutaneous device closure, the minimally invasive approach appears to be a better alternative to the highly invasive full sternotomy. The procedure is well established and as reported by Bichell *et al*., most of the time, the procedure requires no conversion to a full sternotomy, and no cannulation attempt is abandoned for an alternate site [5]. The exposure is good with a good surgical view. The closure technique is the same like in the full sternotomy. Cross-clamp and cardiopulmonary bypass times were equivalent to those in the full sternotomy group [6]. No morbidity was reported during the postoperative course. Analgesic treatment was reduced and we did not give morphine. Hospital stay lasted shorter than those of full sternotomy patients in our department but it was longer than the series of experienced centers [7]. As the case was the first of the series, the staff took time to manage properly and to make sure the patient was safe while discharging from the hospital. This case was certainly one of the rare minimally invasive procedures in cardiac surgery of our region. The plan is to establish this procedure for ASD

closure then the approach can be extended to other procedures such the aortic valve replacement and mitral valve surgeries.

CONCLUSION

ASD is a common defect in infants whose traditional treatment was an operative closure. Currently, device closure is the gold standard treatment where interventional cardiology is available. Minimally invasive approach is technically feasible in the low-income countries that recently started cardiac surgery. It is a safe and comfortable alternative to the full sternotomy for ASD surgical closure. The next step will be to extend this approach to the other procedures in cardiac surgery.

Conflict of Interest

The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest"

REFERENCES

1. Le Gloan L, Legendre A, Iserin L, Ladouceur M. Pathophysiology and natural history of atrial septal defect. J Thorac Dis. 2018;10 (24):2854-2863. DOI: 10.21037/jtd.2018.02.80
2. Bennhagen RG, McLaughlin P, Benson LN. Contemporary management of children with atrial septal defects: a focus on transcatheter closure. Am J Cardiovasc Drugs. 2001; 1:445–454. DOI : 10.2165/00129784-200101060-00004
3. Sharma V, DeShazo RA, Skidmore CR, Glotzbach JP, Koliopoulou A, Javan H, et al. Surgical explantation of atrial septal closure devices for refractory nickel allergy symptoms. J Thorac Cardiovasc Surg. 2020; 160:502–509. DOI: 10.1016/j.jtcvs.2019.10.177
4. Sawadogo A; Bazongo M, Belem PF Zonga Y Somé NH, Tamboura Y, Naré Y, Sanou A, Sanou A. Early Results of the First 15 Operative Closures of Atrial Septal Defect in Burkina Faso, West Africa. Nigerian Journal of Cardiovascular & Thoracic Surgery 2022; 7(1):12-16. DOI: 10.4103/njct.njct_2_24
5. Bichell DP, Geva T, Bacha EA, Mayer JE, Jonas RA, del Nido PJ. Minimal access approach for the repair of atrial septal defect: the initial 135 patients. Ann Thorac Surg. 2000; 70:115–118. DOI: 10.1016/s0003-4975(00)01251-0
6. Baharestani B, Rezaei S, Jalili Shahdashti F, Omrani G, Heidarali M. Experiences in surgical closure of atrial septal defect with anterior mini-thoracotomy approach. J Cardiovasc Thorac Res. 2014;6(3):181-184. DOI: 10.15171/jcvtr.2014.008
7. Lee T, Weiss AJ, Williams EE, Kiblawi F, Dong J, Nguyen KH. The right axillary incision: a potential new standard of care for selected congenital heart surgery. Semin Thorac Cardiovasc Surg. 2018; 30:310–316. DOI: 10.1053/j.semtcvs.2018.02.011