International Journal of Surgery Case Reports 103 (2023) 107902

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Case report

Autologous vein graft repair of mycotic innominate artery aneurysm: A case report

Hina Inam [a], Abdul Ahad [b], Rita Sundardas [c], Fareed Ahmed Shaikh [e,*], Shahabuddin Sharfuddin [d], Nadeem Ahmed Siddiqui [e]

[a] Section of Cardiothoracic Surgery, Aga Khan University Hospital Karachi, Pakistan
[b] Resident Cardiothoracic Surgery, Section of Cardiothoracic Surgery, Aga Khan University Hospital Karachi, Pakistan
[c] Aga Khan University Hospital Karachi, Pakistan
[d] Cardiothoracic Surgery, Aga Khan University Hospital Karachi, Pakistan
[e] Vascular Surgery, Link Building, Department of Surgery, Aga Khan University Hospital, Stadium Road, Karachi, Pakistan

ARTICLE INFO

Keywords:
Innominate artery aneurysm
Mycotic aneurysm
Femoral vein graft
Infected aneurysm

ABSTRACT

Introduction: Innominate artery aneurysm (IAA) is an extremely rare fatal condition with an overall prevalence of less than 3 % of all supra-aortic artery aneurysms. These infrequent lesions usually present as an emergency and require challenging surgical procedures.

Case presentation: We report an interesting case of mycotic IAA in a 25 years old male patient. He was a known intravenous drug abuser having mycotic aneurysm arising from brachiocephalic artery with eccentric thrombus causing adjacent mass effect over the trachea. He underwent successful emergent surgical management of aneurysm with autologous vein graft using superficial femoral vein. Unfortunately, he died due to massive upper gastrointestinal bleeding leading to multi-organ failure after a prolonged post-operative course.

Clinical discussion: Mycotic aneurysms of the IA are extremely rare with an overall incidence of 1–2.7 % cases of all IAA. Presentation of the IAA can be quite variable from asymptomatic to symptoms exhibiting mass effect over surrounding structures. Rupture of IAA can be fatal and can occur if not treated promptly. There are no current recommendations or guidelines for treatment and interventions in IAA. Surgical management involves complete excision of the aneurysm and then revascularization.

Conclusion: Infected Innominate artery aneurysm is a rare surgical entity requiring early diagnosis, detailed investigation and prompt surgical management involving multidisciplinary team approach. Our case describes a relatively innovative approach to this scarce condition.

1. Introduction

Brachiocephalic artery (innominate artery) aneurysm is an extremely rare fatal condition with an overall prevalence of less than 3 % of all supra-aortic artery aneurysms [1–3]. The extent of the aneurysm on Innominate Artery (IA) varies and has been divided into three subtypes by Kieffer et al. as shown in Fig. 1 [3,4]. All IAA can lead to fatal consequences if left untreated as they increase rapidly in size with reported incidence of rupture as high as 11 % [3,5]. All recent case reports advocate its early surgical or endovascular repair upon diagnosis as the mortality after emergency surgery has been reported to be as high as 50 % [1,5,6].

Mycotic IAA has an incidence of only 1–2.7 % of all IAA [2,3]. Several other common causes of IAA are trauma, congenital malformation, atherosclerosis, iatrogenic, vasculitis, tuberculosis, connective tissue or degenerative disorders or syphilis [2–5,7].

We report an interesting case of large mycotic IAA in a young patient. He was a known intravenous drug abuser having mycotic aneurysm arising from brachiocephalic artery with adjacent mass effect over the trachea causing airway compromise. He underwent successful emergent surgical management of IAA with autologous vein graft. This type of presentation and management of mycotic IAA has not been reported in literature previously to the best of our knowledge. This case report has been reported in line with SCARE 2020 criteria [8].

* Corresponding Author
E-mail address: Fareed.shaikh@aku.edu (F.A. Shaikh).

https://doi.org/10.1016/j.ijscr.2023.107902
Received 6 November 2022; Received in revised form 7 January 2023; Accepted 11 January 2023
Available online 12 January 2023

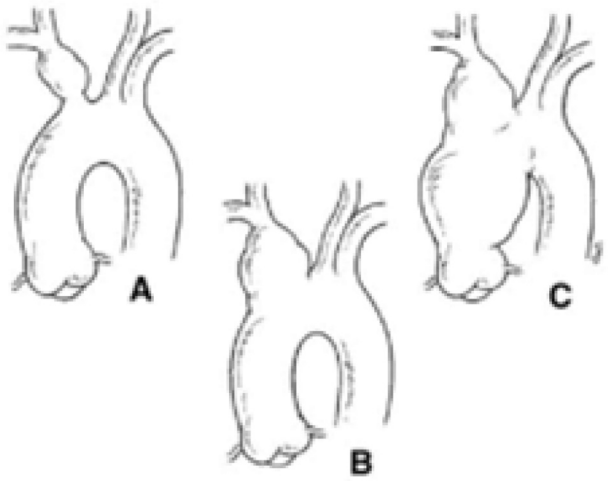

Fig. 1. Classification of IAA according to extent of involvement. A, Group A, no involvement of origin of IA; B, group B, involvement of origin of IA but not of aorta; C, group C, involvement of IA and aorta [12].

2. Presentation of case

A 25 years old gentleman, known case of acid-peptic disease and intravenous drug abuser, came to emergency department (ED) of Aga Khan University Hospital Karachi, Pakistan, with the presenting complaints of hoarseness of voice for 1 month and progressively worsening shortness of breath for 1 day. On arrival in the ED he was tachypneic and tachycardiac with stridor. Portable chest x-ray raised suspicion of mediastinal mass (Fig. 2), He emergently underwent high risk intubation for excessive work of breathing and was admitted in intensive care unit for supportive care and strict blood pressure control. The computed tomography (CT) angiogram (Fig. 3) showed large saccular aneurysm of innominate artery (IA). It was extending from just after its origin up to its bifurcation, measuring 61 × 37 × 66 mm in transverse, anteroposterior and craniocaudal dimensions. It caused significant mass effect over the trachea with left lateral deviation. It was compressing the superior vena cava (SVC) with non-visualization of the right internal jugular vein. Preoperative echocardiography was unremarkable. Broad-spectrum antibiotics along with intravenous antifungals were given. Vascular, Cardiothoracic surgery and anesthesia team collaborated and he underwent surgery within 24 h of his presentation to emergency department.

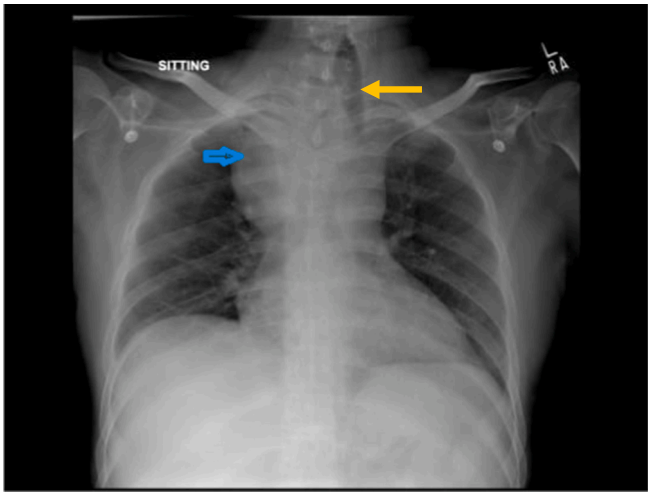

Fig. 2. Preoperative chest x-ray showing a mass (blue arrow) and deviation of trachea (yellow arrow).

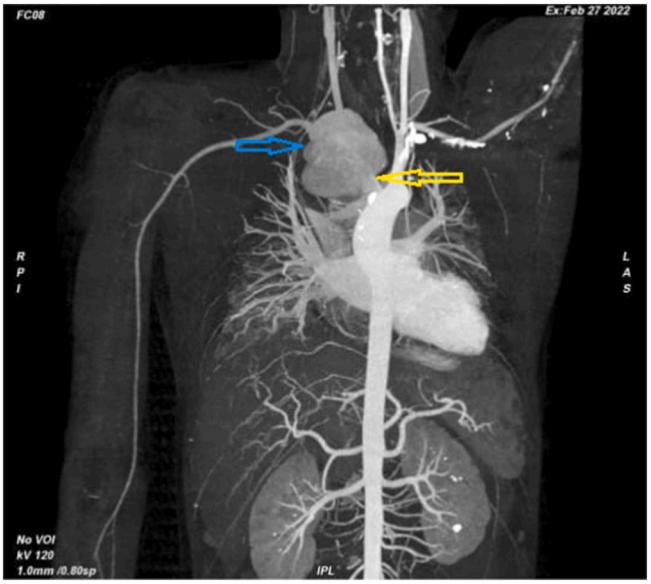

Fig. 3. CT angiography demonstrating a large saccular mass (blue arrow) arising from IA (yellow arrow).

2.1. Surgical procedure

All aseptic measures and standard preparation and draping were done. Vertical groin incision was given at mid inguinal point and right common femoral artery and vein were exposed, cannulated and connected to cardiopulmonary bypass (CPB) machine. This precautionary measure was taken due to the close proximity of the aneurysm to the sternum with high risk of rupture during midline sternotomy. Left Superficial femoral vein of approximately 10 mm in diameter was harvested. Midline incision was given extending into right cervical region along anterior border of sternocleidomastoid muscle. Median sternotomy was performed for access to the aneurysm. As expected, the aneurysm ruptured during dissection hence femoral–femoral CPB was initiated preventing hemodynamic collapse.

Our intra-operative findings revealed: Large aneurysm of innominate artery of about 61 × 37 × 66 mm extending from mid to distal segment up to bifurcation, involving posterior wall of IA. Aneurysm was surrounded by thick, inflamed tissue and extending into deep cavity lateral to carotid and subclavian junction. A healthy proximal stump of innominate artery was made. Infected aneurysmal tissue was debrided thoroughly.

Moderate hypothermia to 32 °C was achieved. Thick inflamed tissue overlying the arch and proximal IA was dissected in layers to expose the full length of the IA. Vascular control was taken around right common carotid artery, right proximal IA, subclavian artery and left common carotid artery. As aneurysm ruptured during dissection, proximal right IA was clamped. Aneurysmal segment was excised completely and cavity debrided. Stump was closed using multiple polypropylene pledgeted sutures. Partial aortic cross clamp was applied on ascending aorta and superficial femoral vein graft was anastomosed proximally to aorta in end-to-side fashion using continuous prolene 4/0. Graft was sequentially anastomosed to right subclavian artery in end-to-side fashion and its distal end was anastomosed to right common carotid artery in end-to-end fashion as shown in intraoperative picture (Fig. 4). Thorough irrigation of aneurysmal cavity was done. Patient was warmed and CPB was smoothly weaned off. Hemostasis was secured and multiple closed suction drains were placed in mediastinum, pleurae, neck and groin.

Histopathology of the brachiocephalic artery aneurysm, right common carotid artery and right subclavian artery stump showed fibro collagenous and vascular tissue containing extensive acute

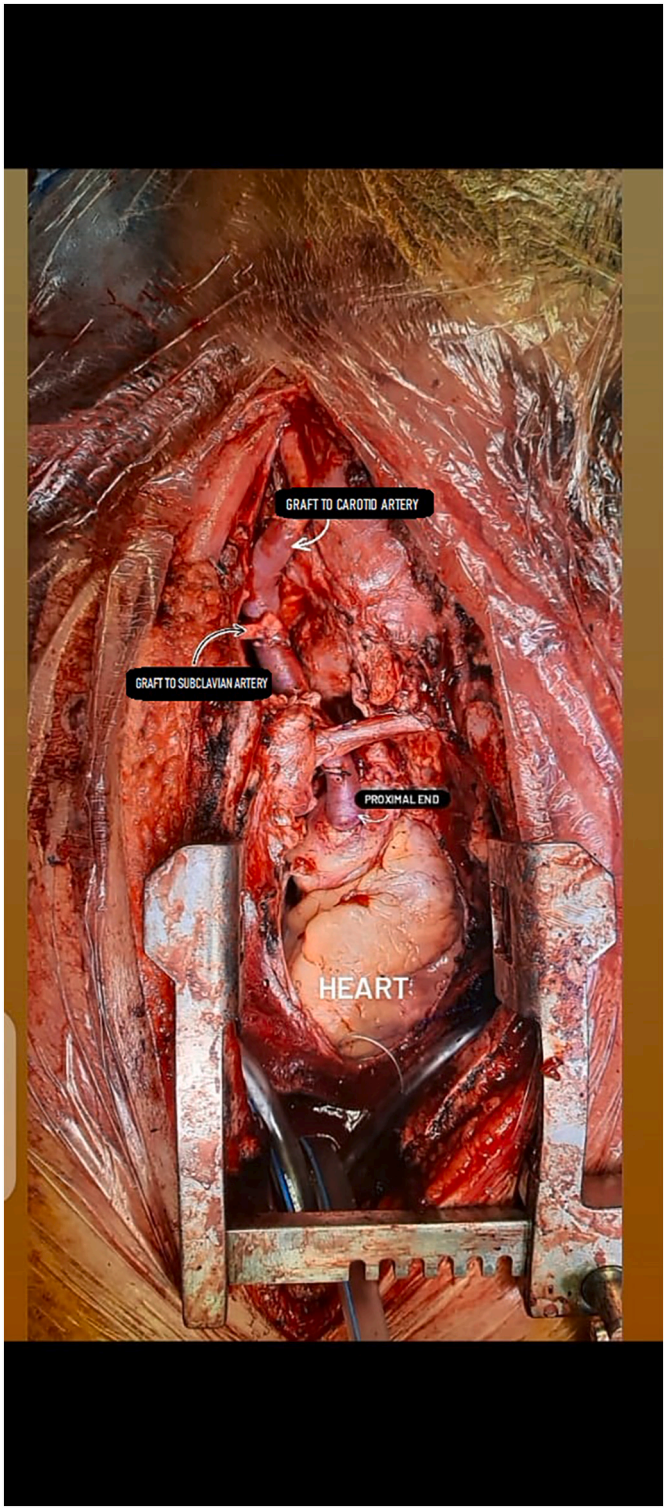

Fig. 4. Intra-operative picture after reconstruction with superficial femoral vein graft.

inflammation with necrotic slough. Numerous septate fungal hyphae were seen throughout the tissue showing occasional branching.

Tissue cultures of the aneurysm demonstrated heavy growth of Aspergillus fumigates and few colonies of pan-sensitive Burkholderia (Pseudomonas) cepacia.

2.2. Post-operative course

Post-operatively patient was shifted back to intensive care unit. He was extubated successfully in next 24 h with no requirement of inotropes. He was kept on broad spectrum antibiotics, antiplatelet therapy and deep venous thrombosis as well as gastric prophylaxis. He recovered well, was ambulated and was shifted out to special care unit with minimal drain outputs. However, he became tachycardiac and tachypneic with multiple fever spikes. His blood cultures showed multi-drug resistant Acinetobacter species. He was given appropriate intravenous antibiotics and anti-fungal (amphotericin) regimen as advised by infectious disease to control his sepsis. Unfortunately, on post-operative day 10, he developed severe upper gastrointestinal bleeding secondary to suspected gastric/duodenal ulcers as patient had a significant history of acid-peptic disease. This lead to hemodynamic collapse and cardiac arrest requiring 45 min of cardiopulmonary resuscitation (CPR) before return of spontaneous circulation was achieved. However, he suffered from Post CPR hypoxic brain injury, multi-organ failure and was declared as brain dead. Hence family decided for withdrawal of support due to guarded prognosis and the patient expired.

3. Discussion

Presentation of the IAA can be quite variable from asymptomatic to symptoms depending upon the size and the mass effect on the surrounding structures. Patients can present with either dyspnea or stridor due to airway obstruction (as in our case), dysphagia, dysphonia and/or superior vena cava syndrome [6,7]. Embolization of intra-aneurysmal thrombus can lead to cerebrovascular accident or limb ischemia [3]. Rupture of IAA can be quite fatal if not treated promptly. It can occur in patients spontaneously, due to trauma, immunocompromised status (for example on corticosteroids) or having a chronic or connective tissue disease [1,5]. In our case patient had underlying hoarseness for past few days but presented in ED due to worsening shortness of breath for past few hours. This raised the suspicion of expansion of leaking aneurysm.

Many diagnostic modalities can be used to aid in the diagnosis of IAA which includes plain radiographs and echocardiography, however the investigation of choice is CT angiography. It precisely identifies location and the type of IAA which helps in pre-operative surgical planning as done in our case [9].

There are no current recommendations or guidelines for treatment of IAA. However, recent literature suggests that due to its high morbidity and mortality, all symptomatic IAA, those involving the arch of aorta or asymptomatic IAA greater than 3 cm in diameter should be urgently treated either with endovascular stenting or surgical therapy [4,5,10].

Historically surgical treatment of IAA consists of its ligation resulting in high mortality ranging from 30 to 78 % [3,5]. However recent advances in its surgical management have resulted in considerable improvement in its short- and long-term survival with a mortality of about 4.7 % [3,5]. Surgical management involves complete excision of the aneurysm and then revascularization [5]. Multiple case reports have demonstrated the use of commercially available Dacron grafts and xenoprosthetic bovine pericardial grafts [2,3,10,11]. In our case it was mycotic (Infected) aneurysm, the patient was young, stable at the time of surgery as well as we had experienced team which comprised of two consultants from each vascular and cardiothoracic surgery along with experienced cardiac anesthesiologist, hence we decided to use autologous (SFV) graft instead of prosthetic.

Additionally for mycotic IAA, the use of broad spectrum antibiotics should be started pre-operatively and continued post-operatively for prolonged period of time to prevent graft infection, anastomotic leaks and sepsis [1,2]. Hence autologous grafts have been advocated as the best option for revascularization after resection of the mycotic IAA [1]. Therefore, in our patient we used an autologous graft of superficial femoral vein, anastomosing it directly to the aorta, right subclavian artery and right common carotid artery as described above.

Furthermore, the patient remained on broad spectrum antibiotics since the time of presentation till his death.

4. Conclusion

Infected innominate artery aneurysm is a rare but life-threatening surgical entity requiring a multidisciplinary team approach.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

Exemption from hospital Ethical Review Committee was sought.

Funding

Funding was not required for this case report. Hence, we have nothing to declare.

Guarantor

Hina Inam
Fareed Ahmed Shaikh.

Research registration number

Not a study involving human studies.

CRediT authorship contribution statement

1. Hina Inam: Study concept, design, literature search, writing of paper, final review, critical review.
2. Abdul Ahad Sohail: Study design, writing of paper and drafting of paper and review of paper.
3. Rita Sundardas: Study concept, design, literature review, writing of paper and review.
4. Nadeem Siddiqui: Study concept and design, literature review, finalising of paper and critical review.
5. Syed Shahabuddin Sharfuddin: Study concept and design, literature review, finalising of paper and critical review.
6. Fareed Ahmed Shaikh: Study concept and design, literature review, finalising of paper and critical review.

Conflict of interest

Nothing to declare.

References

[1] M. Pasic, T. Carrel, M. Vogt, L. von Segesser, M. Turina, Treatment of mycotic aneurysm of the aorta and its branches: the location determines the operative technique, Eur. J. Vasc. Surg. 6 (4) (1992 Jul 1) 419–423.
[2] A.H. Hoff, F. Akca, P.W. Cuypers, J.F. Ter Woorst, Mycotic innominate artery aneurysm repair using a bovine pericardial bifurcation prosthesis, J. Card. Surg. 33 (3) (2018 Mar 11) 146–148.
[3] X.L. Wang, X.L. Guan, W.J. Jiang, O. Liu, H.J. Zhang, Innominate artery aneurysm, how to solve it? J. Int. Med. Res. 45 (3) (2017 Jun) 1279–1284.
[4] T. Hirose, N. Tabayashi, Y. Yoshikawa, T. Abe, H. Naito, Y. Hayata, K. Yamashita, S. Taniguchi, Isolated dissecting aneurysm of the brachiocephalic artery associated with contained rupture, Gen. Thorac. Cardiovasc. Surg. 60 (4) (2012 Apr) 225–227.
[5] E. Soylu, L. Harling, H. Ashrafian, V. Anagnostakou, D. Tassopoulos, C. Charitos, J. Kokotsakis, T. Athanasiou, Surgical treatment of innominate artery and aortic aneurysm: a case report and review of the literature, J. Cardiothorac. Surg. 8 (1) (2013 Dec) 1–8.
[6] H. Munakata, K. Okada, H. Tanaka, T. Yamashita, K. Nakagiri, Y. Okita, Acute dissection of the innominate artery: a case of report, Gen. Thorac. Cardiovasc. Surg. 56 (3) (2008 Mar) 131–133.
[7] A. Robaldo, D. Apostolou, E. Peano, C. Novali, Giant saccular aneurysm of the innominate artery, Interact. Cardiovasc. Thorac. Surg. 30 (2) (2020 Feb) 321–323.
[8] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[9] Amit Nandan Dhar Dwivedi, Multiple mycotic aneurysms of the abdominal aorta illustrated on MDCT scanner, J. Clin. Imaging Sci. 5 (49) (31 Aug. 2015), https://doi.org/10.4103/2156-7514.163993.
[10] K. Sugiyama, H. Watanuki, Y. Futamura, M. Okada, S. Makino, K. Matsuyama, Surgical treatment for brachiocephalic artery aneurysm with takayasu arteritis using isolated cerebral perfusion: a case study, J. Cardiothorac. Surg. 16 (1) (2021 Dec) 1–5.
[11] A.A. MacLean, L.A. Vricella, J.A. Freischlag, Innominate artery aneurysm, Eur. J. Cardiothorac. Surg. 32 (5) (2007 Nov 1) 803.
[12] E. Kieffer, L. Chiche, F. Koskas, A. Bahnini, Aneurysms of the innominate artery: surgical treatment of 27 patients, J. Vasc. Surg. 34 (2) (2001 Aug) 222–228, https://doi.org/10.1067/mva.2001.115807. PMID: 11496272.