CASE REPORT

# Iatrogenic AV Fistula of Breast Following Core Biopsy

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## ABSTRACT

A young lady attended a one-stop breast clinic for assessment of a left breast lump on the background of cosmetic implants. A triple assessment of the lump found a benign cyst. At the time of the biopsy, she had excessive bleeding and developed a hematoma. She was represented subsequently after hearing an unusual noise from her left breast. A palpable pulsatile mass was found on examination. Imaging the new lesion was diagnostic of an arteriovenous fistula (AVF). On review of the literature, six case reports of iatrogenic AVF in the breast were found; however, this case is unique as no other cases occurred in patients with breast implants.

The AVF was treated with a surgical tie-off procedure whilst her breast implants remained *in situ.* She remains well and has been discharged from Breast Surgery care. AVF remains a rare and therefore often unexpected complication of biopsy. It is important to be aware of this, especially when a biopsy is performed on the lateral side of the breast and the patient develops a hematoma.

**Keywords:** *AV fistula, iatrogenic fistula, arteriovenous fistula, breast biopsy, breast disease.*

## BACKGROUND

Breast cancer is the most common cancer in women globally. In the UK, it affects 55,920 women annually [1]. Despite new interventions and early diagnosis, the incidence is still rising [1]. Biopsy remains a key tool for diagnosing and differentiating cancerous and benign lesions. As more women are found to have indeterminate lesions due to improving diagnostic imaging, the volume of breast biopsies in outpatient clinics is rising.

AVF is a rare but documented complication of core biopsy of the breast [2]. We conducted a literature review on Ovid Medline, Embase, and Google Scholar to search for previous cases of iatrogenic AV fistula secondary to core biopsy of the breast and present a novel case of management in a patient with cosmetic breast implants.

## CASE PRESENTATION

A 32-year-old female patient presented to the breast clinic with a symptomatic breast lump in the lateral left breast that felt benign on examination. She underwent a triple assessment. In UK, the national assessment of any patient referred with the symptom of breast condition involves triple assessment that includes clinical examination, imaging, and biopsy of the lesion if required [1]. The lump was located 3 o'clock position on the lateral side of the breast. The ultrasound scan showed a 12mm indeterminate lesion of the upper outer quadrant of the breast, categorized as U3 on the US. There was no sign of implant failure sonographically in the bilateral cosmetic breast implants despite being placed 12 years ago. A triple assessment of the lesion included a biopsy. Core biopsy was attempted however the site bled excessively, forming a hematoma. Histopathology proved the lesion to be a benign breast cyst and she was discharged.

The patient did not have any family history of breast or ovarian cancer and was a non-smoker. The only medical history of note was Raynaud's syndrome but this was managed conservatively without medication. The patient was not taking any antiplatelet or anticoagulation therapy.

The patient then represented 3 weeks later having heard a 'humming noise' from her left breast, around the site of her biopsy. Her concerns were initially dismissed, however, when she explained that the lesion was expanding in size she was seen the following week. She

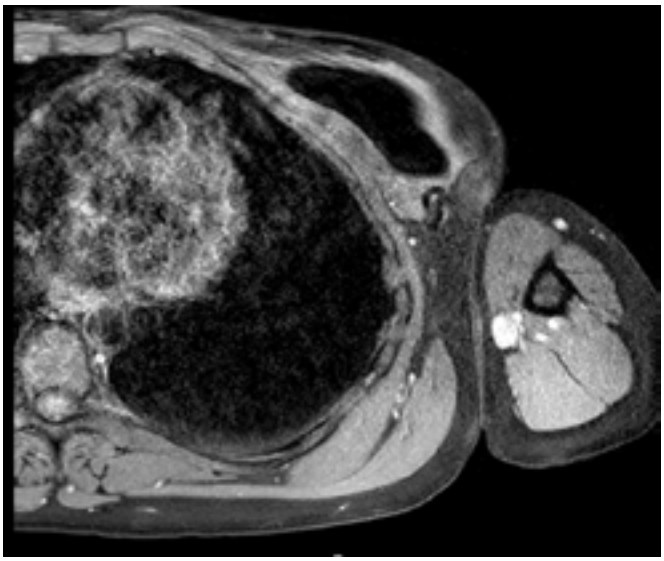

**Fig. (1):** MRI post core biopsy showing a confirmed AV fistula at the left breast.

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**Fig. (2):** CT angiogram corroborating MRI findings of a left breast AV fistula.

was asked to come in for a repeat ultrasound scan, which showed a new vascular lesion adjacent to the previously noted breast lesion. The patient was referred to the regional vascular surgery team to assess the vascular lesion following the attempted core biopsy given the possible creation of a pseudoaneurysm or arterio-venous (AV) fistula. Further imaging of the breast including MRI **(Fig. 1)** and CT angiogram **(Fig. 2)** confirmed the formation of an AV fistula following attempted core biopsy.

## TREATMENT

The AVF in the context of this patient was managed with tie-off of the fistula in a joint open case by vascular and breast surgery. This was achieved with the breast implants remaining *in situ* and without disturbance or complication. An intraoperative duplex scan was performed which identified the afferent vessel of the fistula to be the perforator branch of the lateral thoracic artery at the 4$^{th}$ intercostal space confirming the findings of the MRI scan. The fistula was gently dissected and the origin of the feeding artery and draining vein was identified. Both vessels were ligated, and the residual lesion was sent for benign histology. She had a successful outcome and the procedure resulted in full resolution of her symptoms.

## OUTCOME AND FOLLOW-UP

The patient continues to do well, with no implant-related complications, as a result of her tie-off procedure for the AV fistula. She no longer experienced the palpable pulsations post the off procedure, and she has had a full return to work and normal activities of daily life. She was followed up 3 months later with a repeat CT angiogram which confirmed the resolution of the AVF and the breast implants remained intact **(Fig. 3)**.

The patient only requires routine follow-up post-procedure, after which she can be safely discharged back to the care of her GP.

## DISCUSSION

Our literature review found six published cases of iatrogenic AV fistulas, occurring as a result of biopsy-related invasive procedures **(Table 1)**. None of the published cases described the diagnosis and management of AVF in a patient with cosmetic breast implants.

The search was conducted for the studies published between 1946 and the present. The following Mesh terms and their combination was used: ‘AV fistula’,

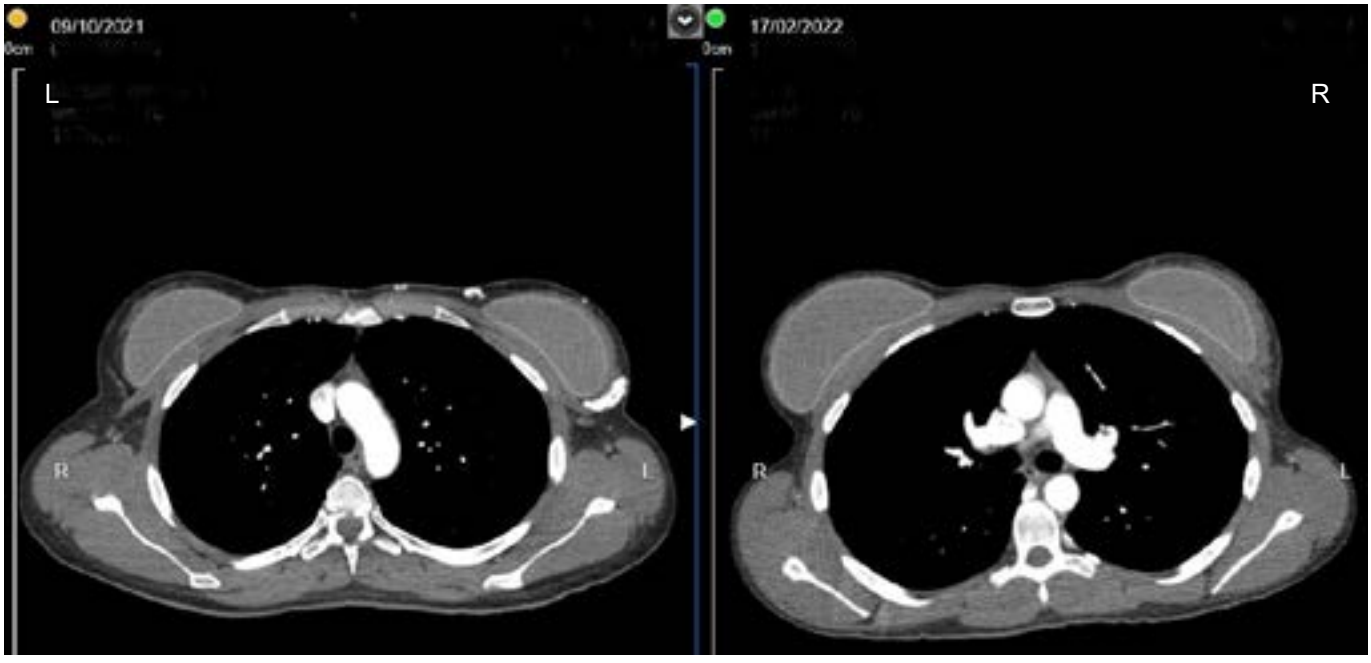


**Fig. (3):** (left) Pre-operative CT angiogram showing left breast AV fistula compared to (right) post-operative CT angiogram showing treatment and resolution of the left breast AV fistula after tie-off procedure.

**Table 1:** Management of iatrogenic AV fistula in previous case reports.

| Previous Case Reports | Breast Lesion | Presentation Time Following Procedure | AV Fistula Size (mm) | Imaging for Diagnosis | Treatment |
|---|---|---|---|---|---|
| Yanagisawa 2020 (Australia) [2] | Benign lump | 2 months | 17 | US doppler, CT angiogram | Failed coil embolisation followed by surgical tie |
| Barker 2017 (Scotland) [3] | Fibroadenoma | 10 months | 17 | US doppler CT angiogram | Surgical tie |
| Gregg 2013 (USA) [4] | Invasive ductal carcinoma | - | 8 | US doppler, MRI angiogram | Surgical excision |
| Haider 2014 (Wales) [5] | Fibroadenoma | 2 weeks | - | US doppler, CT angiogram | Image guided clip embolisation |
| Marongiu 2017 (Italy) [6] | Fibroadenoma | 6 weeks | 8 | US doppler, MRI | Surgical tie |
| Rhodes-Wilson 2004 (USA) [7] | Cyst | 2 days | 40 | US doppler | Surgical tie |

'iatrogenic fistula', 'arteriovenous fistula', 'breast', and 'breast disease'. We found 6 case reports that have reported iatrogenic AV fistula in the breast [2-7].

Most of the cases were reported in the last 10 years. The median age was 41 (with a range of 38 years). Most of the patients were pre-menopausal and one of them was pregnant. In all previous cases, the patients presented with a lump with a loud thrill which was palpable.

The management of AV fistula in previous studies has been described in Table **1**. Half of the cases used a surgical tie as a first-line intervention, one case failed coil embolization requiring final management with a surgical tie. The location of the breast lesion was lateral in all but one of the cases [5]. The feeding artery was most commonly the perforator branch of the lateral thoracic artery and the communicating vein was the branch of the homologous lateral thoracic vein or intercostal vein. Each study reported the use of a standard core biopsy needle (14G) that resulted in fistula formation. The majority of cases developed following a single biopsy however one case occurred after multiple attempts of fine needle aspirations with an 18G needle [7]. All the studies reported excessive bleeding and hematoma formation immediately post-core biopsy. The studies all reported the AV fistula to be high velocity. Diagnosis occurring was 2 weeks to 3 months after biopsy of the inital lesion.

Our case had similarities to the previously reported cases in many respects: the patient was pre-menopausal and the lesion was located laterally. The breast lesion diagnosed was a cyst that was targeted for biopsy. Following the biopsy, there was an immediate hematoma and within 2 weeks, the AV fistula was developed. The feeding vessel was a branch of the lateral thoracic artery and the size of the fistula was similar to previous reports. A surgical tie was performed on the fistula. The imaging modality was US Doppler followed by CT angiogram and MRI. Though Rhodes-Wilson *et al.* concluded that diagnosis could be accurately achieved only using US Doppler, they did not identify the perforating vessels [7].

The added challenge in this case was to manage the breast implants *in situ.* The current UK oncoplastic breast surgery guidance provides a benchmark of implant loss aiming to be 5% or less in the reconstructive setting at the 3-month post-operative period [8]. Surgical intervention in a cosmetic implant patient poses a significant risk of infection and an ethical dilemma of having to self-fund a further replacement should this occur; the patient provided full consent for her AV fistula tie-off procedure knowing this risk and subsequent sequelae. The operative procedure the patient had significantly increased her risk of implant-related infection however good operative technique encouraged by collaborative working with an interdisciplinary team as well as a short procedure and a 'no touch technique' to the implant itself which was protected under the implant capsule.

## CONCLUSION

In conclusion, iatrogenic AVF is a rare complication of a core biopsy procedure in the breast. The number of reports has increased in the last few years. Patients with immediate post-procedure bleeding and hematoma for the biopsy of the lateral lesion of the breast are more prone to develop it due to damage to the branches of lateral thoracic vessels. As clinicians, we should be mindful of these patients. Surgical ligation is the most common and management option.

## CONSENT FOR PUBLICATION

Consent for publication was obtained from the patient discussed in the case report.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ACKNOWLEDGEMENTS

Declared none.

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