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Parietal branch of the superficial temporal artery: An underutilized biopsy site

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Abstract

Purpose: Giant cell arteritis (GCA) is an immune-mediated vasculitis that can lead to significant symptoms and disease sequelae such as headaches, fevers, weight loss, jaw pain, optic neuropathy with permanent vision loss, and stroke. The gold standard for diagnosis of GCA is a temporal artery biopsy (TAB) as it has a high specificity and sensitivity.

The TAB is commonly harvested from the frontal branch of the superficial temporal artery, however given its location, there are potentially significant consequences including facial nerve injury and poor cosmetic outcomes. An alternative to this method is biopsy of the parietal branch, as it reduces the risk of facial nerve injury and comfortably hides the scar line within the hair of most patients.

Results: We describe in detail our department's TAB technique and experience from pre-procedure preparation to post-procedure care.

Conclusion: The parietal branch TAB is a typically underutilised, well tolerated and viable alternative to the frontal branch TAB and it may be considered in the first instance to reduce the risk of complications.

Keywords: Arteritis; Biopsy; Temporal; Vasculitis; Technique; Surgery

1. Introduction

Giant cell arteritis (GCA) is an immune-mediated vasculitis that is often diagnosed in the 8th decade of life and more likely to affect those of Scandinavian descent with a 2.5:1 female to male ratio [1].

GCA presents with cranial symptoms in over 88% of cases, including headaches, scalp sensitivity, jaw claudication, and visual changes. These symptoms can lead to disease sequelae such as permanent vision loss, stroke, or even rarer complications such as lingual ischaemic necrosis [2, 3].

These consequences occur due to inflammation affecting the walls of blood vessels branching from the aortic arch. One of the terminal vessels of the external carotid artery, itself a terminal branch of the common carotid artery of the aortic arch, is the superficial temporal artery (STA). This artery is the most used biopsy site for histopathological diagnosis of GCA and is considered the gold standard diagnostic test, demonstrating a 100% specificity, with a sensitivity of 77% [4]. There are varying suggestions for biopsy length, however the American College of Rheumatology Guideline for management of GCA recommends a specimen length >10mm within 2 weeks of commencing oral glucocorticoids (low level of evidence) [5]. The typical histopathological findings include granulomatous inflammatory infiltrate of the media layer of the artery, with full thickness occlusive vasculitis [6].

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1.1. Anatomy

The layers of the scalp in the location of the STA from outer to inner layer are skin, subcutaneous tissue, temporoparietal fascia, loose areolar tissue (innominate fascia), deep temporal fascia, temporalis muscle, and periosteum. The STA is a terminal branch of the external carotid artery and passes from the parotid gland superiorly, laying just anterior the tragus cartilage of the external ear. It lies within the temporoparietal fascia with the frontal branch of the facial nerve and bifurcates into a frontal branch (FB) and parietal branch (PB). Studies demonstrate that this bifurcation point is normally located above the zygomatic arch (>70%), with the distance from the root of zygoma to bifurcation being on average 22mm [7, 8]. The median distance of the PB from the external auditory pore is 54.4mm (vertically), and the horizontal distance between the STA and external auditory pore being 5.6-13.1mm [9]. It is also important to note that the PB may be absent or hypotrophic in close to 10% of patients compared to 2% for FB.

The frontal branch of the facial nerve lies within the 'danger zone', which has been described as the area delineated by "(1) the tragus of the ear, (2) the junction of the zygomatic arch and lateral orbital rim, (3) the area 2 cm superior to the superior orbital rim, and (4) the point superior to the tragus and in horizontal alignment with (3)" [10]. The facial nerve is therefore at risk during the commonly harvested FB biopsy and is injured in up to 16% of cases [11]. There may also be poor cosmetic outcomes due to scarring of the skin on the forehead when performing FB biopsies.

An alternative to this method is biopsy of PB, as it reduces the risk of facial nerve injury by remaining outside the danger zone in the majority of cases. Another benefit is that it hides the scar line comfortably within the hair of most patients, which is especially beneficial when an extended incision is required. Although there are no studies to directly compare the sensitivity of PB versus FB for diagnosis of GCA, it has been suggested based on ultrasound studies that PB can be used as a biopsy site for GCA [12, 13].

Our department routinely performs temporal artery biopsies (TAB) for the diagnosis of GCA. We describe in detail our department's TAB technique from pre-procedure preparation to post-procedure care.

2. Materials and methods

Table 1 Required equipment

Handheld ultrasound doppler	**Mosquito forceps**
Lubricating gel	Self-retaining retractor
Skin marker	Dissection scissors
Hair clipper	3-0 Vicryl (Polyglactin 910) hand tie (or other resorbable hand tie material)
Skin preparation solution eg chlorhexidine	
	Suture scissors
Local anaesthetic eg 2% Lignocaine + 1:100,000 Adrenaline	Needle holder
	Toothed and non-toothed tissue forceps
Gauze	Formalin fixation pot
Drapes	3-0 Vicryl rapide (Polyglactin 910) or other suitable scalp skin suture
15 blade + handle	
Bipolar diathermy	1% chloramphenicol ointment

3. Results and Discussion

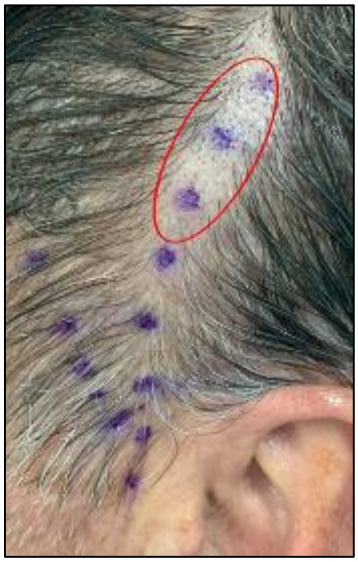
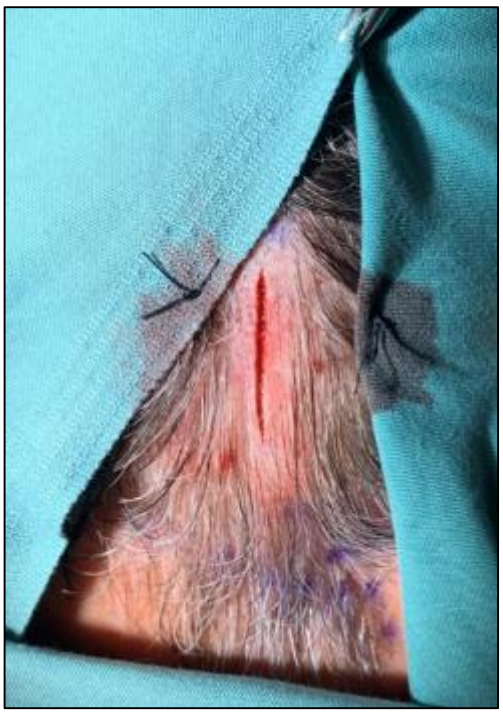


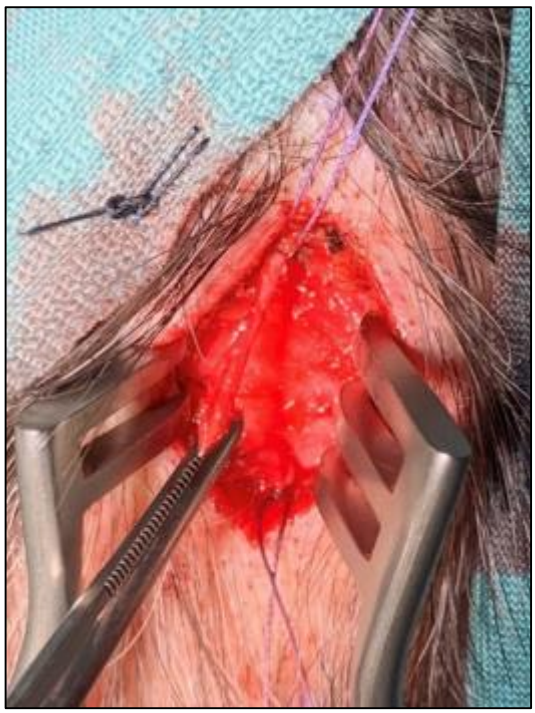
Figure 1 Mapping of PB (circled).

Using a handheld ultrasound doppler with lubricating gel, map out the STA. Begin just anterior to the tragus to identify STA, then follow the PB supero-posteriorly.

Travel well into the hairline and use a dotted line to map a 5cm segment of PB from the bifurcation. Use a hair clipper to remove a 1.5cm wide strip of hair overlying the dotted line. Administer the local anaesthetic subcutaneously on either side of the dotted line.



Figures 2 Incision of skin



Figures 3 IIdentification of STA

Using a 15 blade, make an incision along the dotted line, approximately 2 cm in length, from a point 3cm above the bifurcation of FB and PB

Spread the skin and subcutaneous tissue with a mosquito forceps to reach the temporoparietal fascia, within which the STA runs. Place a self-retainer to retract the wound edges. Identify the PB and ligate larger branches with 3-0 vicryl hand ties and smaller branches with bipolar cauterisation. Suitable larger branches may also be harvested with the sample once ligated.

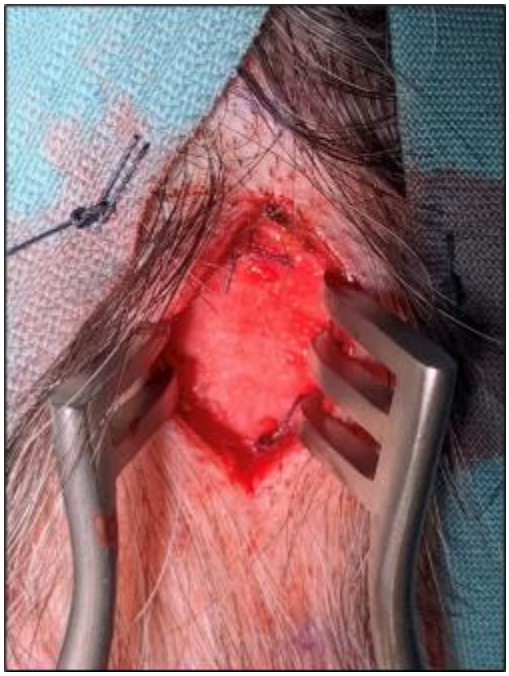


Figure 4 Ligation of STA.

Ligate the segment of PB proximal and distally, ensuring a biopsy length of 2cm to account of pre-fixation shrinkage. Use tissue scissors to CUT both ends of PB (on the side of the artery to be removed) leaving a 2mm segment to prevent slipping of the hand tie. Use bipolar diathermy or dissection scissors to remove fascia from the artery. Place sample immediately in formalin solution.

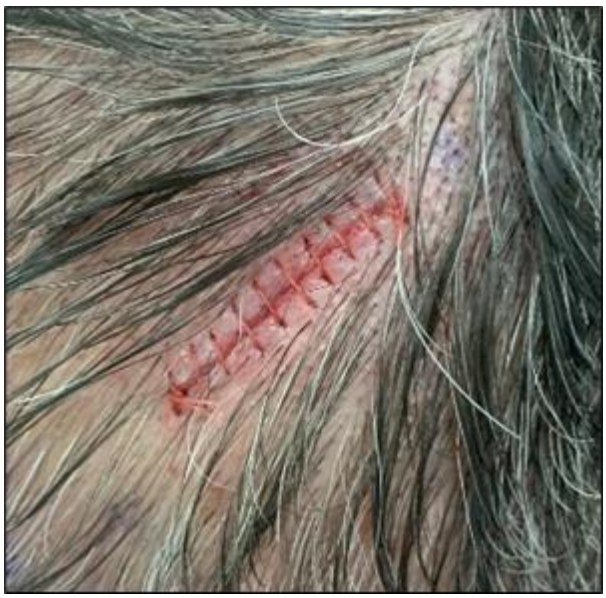


Figure 4 Closure of wound.

Suture the wound closed with 3-0 vicryl rapide or other suitable suture material.

3.1. Post operative orders

1% chloramphenicol ointment three times a day for 7 days, keep clean and dry for 3 days, and simple analgesia (eg paracetamol as required). Antibiotic prophylaxis may also be considered.

4. Conclusion

The PB TAB is a typically underutilised, well tolerated, and viable alternative to the FB TAB and it may be considered in the first instance to reduce the risk of complications.

Compliance with ethical standards

Disclosure of conflict of interest

The authors had no conflicts of interest to declare.

Statement of informed consent

Informed consent was obtained from all involved participants included in the study.

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