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Necessity of Temporal Artery Biopsy for Giant Cell Arteritis: A Systematic Review

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Background: Temporal artery biopsy (TAB) is currently the gold standard procedure to diagnose giant cell arteritis. Despite low sensitivity, TAB is routinely performed even if a clinical diagnosis has already been made. The objective of this study was to determine the usefulness of TAB for giant cell arteritis management.
Methods: We performed a systematic review to identify studies that compared steroid treatment between TAB+ and TAB– patients. EMBASE, MEDLINE, and the Cochrane Central Register of Controlled Trials were searched from inception until April 4, 2020. Titles, abstracts, and full texts were reviewed by two independent reviewers and conflicts resolved by consensus. Studies reporting TAB result and steroid treatment were included. Information pertaining to steroid treatment was compared between TAB+ and TAB– groups. Steroid duration was compared by grouping patients in a less than 6 month group, a 6–24 month group, and a more than 24 month group.
Results: An estimated 5288 abstracts were screened and 13 studies involving 1355 patients were included. Rate of prebiopsy steroid treatment was higher in TAB+ patients compared with TAB– patients [93% versus 63% ($P < 0.001$)]. The TAB+ group was more likely to be started on steroids prebiopsy [28% versus 8% ($P < 0.001$)]. TAB+ and TAB– patients had similar steroid duration for all groups [<6-month group 17% versus 19% (P-0.596), the 6-24-month group 16% versus 19% (P-0.596), and the >24-month group 66% versus 63% (P-0.642)].
Conclusion: TAB results have minimal impact on treatment, and the utility should be reconsidered when a clinical diagnosis of giant cell arteritis is possible. *(Plast Reconstr Surg Glob Open 2022;10:e4185; doi: 10.1097/GOX.0000000000004185; Published online 20 May 2022.)*

INTRODUCTION

Temporal artery biopsy (TAB) has long been considered the gold standard to confirm a diagnosis of giant cell arteritis (GCA).[1] Although a positive TAB has a strong specificity (100%), there has been debate on the efficacy of TAB due to the low sensitivity and thus, a high rate of false negatives (up to 44%).[2]

The American College of Rheumatology (ACR) has established criteria to diagnose GCA, which includes, but is not exclusively dependent on, TAB. Namely, diagnosis of GCA can be made when three or more of the following criteria are met: age greater than 50 years, temporal artery tenderness, new-onset localized headache, increased erythrocyte sedimentation rate (≥50 mm/hour by Westergren method), and positive TAB.[3] These criteria have a reported sensitivity of 93% and specificity of 91%.[3] Plastic surgeons often perform TABs, which may be due to the proximity of the facial nerve. A recent study showed plastic surgeons performed 23.6% of total TABs in Ontario, Canada.[4]

Due to the previously mentioned low sensitivity of TAB, physicians may choose to treat patients empirically before TAB with steroids, as untreated GCA carries serious, potentially permanent complications (ocular ischemia, vision loss, and stroke).[5–7] Often, steroid treatment is initiated even before diagnostic investigations, including TAB, are completed.[5]

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TAB is not without surgical risk. Complications include hematoma and infection; rarely, serious complications such as facial nerve paresis and skin necrosis have been reported.[7] Furthermore, steroid treatment has known, serious side-effects such as hyperglycemia, adrenal suppression, immunosuppression, and many others.[8]

The purpose of this systematic review was to determine the impact of TAB on management of GCA, by comparing steroid treatment between TAB positive and negative patients.

Takeaways

Question: Does temporal artery biopsy (TAB) impact treatment of patients with suspected giant cell arteritis (GCA)?

Findings: A systematic review of 13 studies including 1355 patients was conducted. Patients with positive TAB were more likely to receive steroids; however, treatment duration did not differ significantly from patients with negative TAB.

Meaning: TAB does not significantly impact treatment duration of patients with GCA.

METHODS

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,[9] using a study protocol registered in PROSPERO (CRD42020195670).

Search Strategy and Study Selection

EMBASE, MEDLINE, and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception until April 4, 2020. With the help of a medical librarian, a systemic literature review search was performed using different combinations of search terms for the disease (giant cell arteritis, temporal arteritis, arteritides, and temporal artery), and procedure (biopsy, pathology, diagnosis, excision), and treatment. (**See appendices, Supplemental Digital Content 1,** which displays (a) search terms, (b) Newcastle Ottawa Scale scoring, and (c) Oxford Centre for Evidence-Based Medicine Levels of Evidence determination. **http://links.lww.com/PRSGO/B963**.)

Two independent authors screened titles and abstracts using predetermined inclusion and exclusion criteria, and conflicts were resolved by consensus. Full texts were then reviewed using the same criteria (Table 1). A priori inclusion criteria included articles with original patient populations that were suspected of having GCA and were included for review if they reported both positive and negative TAB results, as well as steroid dose or duration after the procedure was performed. Articles that only reported steroid use before TAB had a short follow-up period (<2 weeks), had fewer than 20 patients (ie, case reports or case series with n < 20), or articles with insufficient information were excluded. The Newcastle Ottawa Scale was used for assessing the quality of cohort studies.

Data Extraction

Data pertaining to study information (author, subspecialty, publication date, study design, number of patients), patient demographics, TAB information, steroid management, and secondary outcomes of interest were extracted by two authors independently. Patients were categorized into TAB+ and TAB− groups and then compared using descriptive statistics. The primary outcome was corticosteroid treatment, which was assessed by recording treatment received before TAB, as well as continuation or discontinuation of treatment following TAB. Secondary outcomes recorded included patient symptoms, ACR score, positivity rate, and discipline of the authors conducting the study. All outcomes were reported using proportions. All comparisons were conducted using a chi-squared test, and a p value of less than 0.05 was considered significant.

Table 1. Study Inclusion and Exclusion Criteria

Exclusion Criteria	Inclusion Criteria
Does not report steroid treatment	Reports TAB results
Patient age < 18 years	Suspected GCA diagnosis
Patients with no TAB	Reports treatment for GCA
Case reports and case series (n < 20)	
Non English articles	

RESULTS

Study Selection

In total, 5288 studies were screened following the removal of duplicates (Fig. 1). Of these, 5186 studies were excluded following title and abstract screening, resulting in 102 articles undergoing full-text review. After full-text review, 13 studies reporting on 1355 patients with suspected GCA were included in the systematic review.[1,10–21] The first authors of eight studies were from surgical departments (general surgery,[1,14–16,20] vascular surgery,[12,13] plastic surgery[18]), and five from medical specialties (Rheumatology,[10,11,17] Internal Medicine,[21] Nuclear Medicine[19]). Years of publication ranged from 1989 through 2019.

Patient Demographics and Symptoms

Of the studies that reported sex and age, 73% were women (900 (73%) and the mean age was 70.5 years (Table 2). Studies that reported on prebiopsy symptoms are represented in Table 3. Headache (313 (77%) if TAB+; 308 (65%) if TAB−), jaw claudication [146 (36%) if TAB+; 68 (14%) if TAB−], and visual symptoms (155 (38%) if TAB+; 160 (34%) if TAB−) were the most commonly experienced symptoms (Table 3).

Erythrocyte Sedimentary Rate and Biopsy Length

Of the 13 studies, five[11,13,17,19,21] reported mean erythrocyte sedimentary rate (ESR) (in mm/hour) with a weighted average of 83.2 in the biopsy positive group, and 71.1 in the negative biopsy group. Five studies reported TAB mean length for both groups (Table 4).

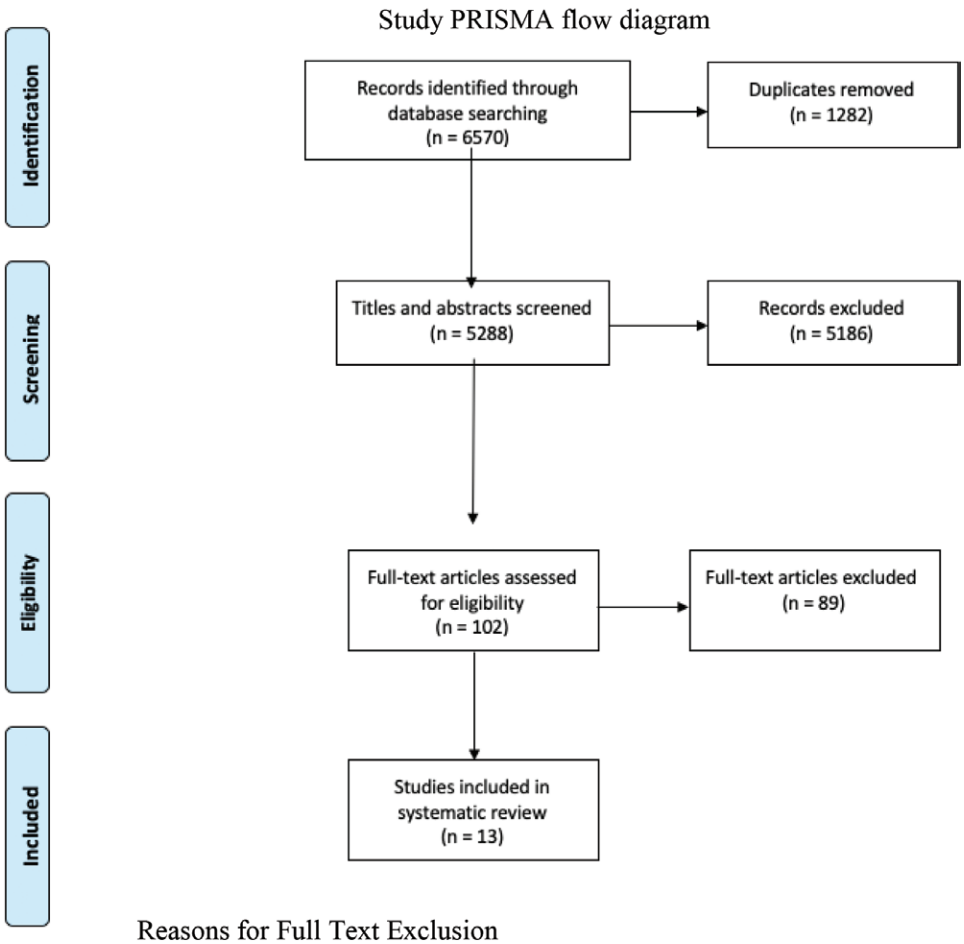

Fig. 1. Study PRISMA flow diagram.

Of the four studies that also reported a measurement of error, the weighted mean length for the TAB+ and TAB– groups were 1.08 cm (SD 0.34) and 1.04 cm (SD 0.47), respectively.

Study Quality Was Strong

Eleven of 13 included studies[1,10–15,17,18,20,21] were retrospective in nature, and two[16,19] were prospective. Overall, the quality of the included studies was high. Using the Newcastle Ottawa Scale for assessing the quality of cohort studies, one study received a score of five, seven received a score of seven, and five received a score of eight. All studies but one were determined to be 2b level of evidence according to the Oxford Centre for Evidence-Based Medicine scale.[22] Duhaut et al were determined to be the sole level 1b (SDC1b, **http://links.lww.com/PRSGO/B963**).

Steroid Use Was Impacted by TAB Result

All 13 studies reported on prebiopsy steroid use. Seven studies[11,12,14,15,17,19,20] reported on both positive and negative TAB prebiopsy steroid duration, and one study[13] reported on only the TAB+ group. Post-biopsy steroid commencement was specifically stated in seven studies,[10-14,16,18] with three studies[10,14,18] commenting on both TAB positive and negative groups.

Table 2. Patient Characteristics

Study	Year	Study Design	N	Women (%)	Mean Age, y	Mean F/U, wk	Before Biopsy ACR ≤ 1 (%)	Before Biopsy ACR 2 (%)	Before Biopsy ACR ≥ 3 (%)	Positive TAB (%)
Duhaut et al[19]	1999	Prospective cohort	292	213 (73)	—	144	—	—	—	207 (71)
Quinn et al[13]	2012	Retrospective cohort	185	131 (75)	71	—	24 (14)	75 (43)	76 (43)	58 (31)
Thomassen et al[14]	2012	Retrospective cohort	143	89 (62)	71	—	—	—	—	34 (24)
Bowling et al[16]	2017	Prospective cohort	129	97 (75)	—	—	2 (2)	20 (16)	107 (83)	17 (13)
Chew et al[18]	2019	Retrospective cohort	101	79 (78)	68.3	5.4	3 (3)	26 (26)	72 (71)	20 (20)
Chmelewski et al[11]	1992	Retrospective cohort	98	67 (68)	69.3	—	—	—	—	30 (31)
Agard et al[21]	2019	Retrospective cohort	80	64 (80)	—	242.4	0	0	80 (100)	56 (70)
Stuart[10]	1989	Retrospective cohort	75	58 (77)	72	—	—	—	—	14 (19)
Chong and Robertson[20]	2005	Retrospective cohort	70	—	—	—	—	—	—	5 (7)
Pieri et al[15]	2013	Retrospective cohort	55	42 (76)	70	—	—	—	—	3 (6)
Cristaudo et al[1]	2016	Retrospective cohort	50	36 (72)	70	—	2 (4)	10 (20)	38 (76)	2 (4)
Lenton et al[12]	2006	Retrospective cohort	44	—	74	—	—	—	—	7 (16)
Belilos et al[17]	2011	Retrospective cohort	33	24 (73)	—	—	—	—	17	10 (30)
Total			1355	900						463 (34)

TAB Positive

In patients with a positive TAB, 219 (93%) received prebiopsy treatment (Table 5). Of the TAB+ patients not receiving prebiopsy treatment, 41 (28%)[10,13–15,18] were started on steroids postbiopsy. Out of two studies that reported,[10,16] there were no TAB+ patients who received prebiopsy steroids, to have cessation of steroids postbiopsy (0/31).

TAB Negative

Prebiopsy steroids were started in 257 (63%) of TAB– patients before biopsy, whereas 28 (8%) of patients who were not started on prebiopsy steroids[10–12,14,18] were started postbiopsy. Nine studies[1,10,12–16,18,20] included postbiopsy information on TAB– patients and 145 (22%) of patients who received prebiopsy steroids had their treatment stopped postbiopsy.

With respect to steroid management, the TAB+ group received more steroid treatment across all treatment categories (prebiopsy treatment ($P < 0.001$), starting steroids postbiopsy ($P < 0.001$), stopping steroids postbiopsy ($p < 0.010$), and continuing steroids that had been started prebiopsy ($P < 0.001$) (Table 5).

Steroid Duration Showed Little Difference between TAB Results

TAB steroid duration was divided into three groups: less than 6 months, 6–24 months, and more than 24 months. Eight studies[11,15,16,19–21] reported on TAB+ steroid duration while only five[1,15,16,19,21] reported on TAB– steroid duration (Table 6).

TAB Positive

For the TAB+ patients, 50 (17%) of patients received steroids for less than 6 months, 47 (16%) received steroids for 6–24 months, and 198 (66%) received steroid treatment for more than 24 months.

TAB Negative

For the TAB– patients, 29 (19%) received steroid treatment for less than 6 months, 21 (19%) were treated for

Table 3. Patients Presenting Symptoms

	Total, n		n	Headache, n (%)	Jaw Claudication, n (%)	Visual Symptoms/ Ocular Abnormality, n (%)	Temporal Tenderness/ Abnormality, n (%)	Fever, n (%)	Weight Loss, n (%)	PMR, n (%)
Duhaut et al[19]	292	TAB +	207 (70.9)	171 (82.6)	84 (40.6)	65 (31.4)	127 (61.4)	98 (47.3)	54 (26.1)	83 (40.1)
		TAB–	85 (29.1)	79 (92.9)	24 (28.2)	65 (76.5)	25 (29.4)	44 (51.8)	23 (27.1)	55 (64.7)
Quinn et al[13]	185	TAB +	58 (31.4)	43 (74.1)	17 (29.3)	43 (74.1)	—	—	—	—
		TAB–	124 (67.0)	83 (66.9)	16 (12.9)	40 (32.3)	—	—	—	—
Thomassen et al[14]	143	TAB +	34 (23.4)	25 (73.5)	13 (38.2)	9 (26.5)	27 (79.4)	4 (11.8)	—	3 (8.9)
		TAB–	99 (69.2)	48 (48.5)	8 (8.1)	20 (20.2)	55 (55.6)	17 (17.2)	—	27 (27.3)
Chmelewski et al[11]	98	TAB +	30 (30.6)	28 (93.3)	15 (50)	25 (83.3)	14 (46.7)	17 (56.7)	—	17 (56.7)
		TAB–	68 (69.4)	42 (57.1)	12 (17.6)	15 (22.1)	21 (30.9)	40 (58.8)	—	47 (69.1)
Agard et al[21]	80	TAB +	56 (70)	31 (55.4)	9 (16.1)	6 (10.7)	10 (17.9)	22 (39.3)	32 (57.1)	14 (25)
		TAB–	24 (30)	18 (75)	3 (12.5)	2 (8.3)	5 (20.8)	10 (41.7)	11 (45.8)	7 (29.2)
Stuart[10]	75	TAB +	14 (18.7)	8 (57.1)	4 (28.6)	6 (42.9)	9 (64.3)	1 (7.1)	3 (21.4)	—
		TAB–	61 (81.3)	29 (47.5)	2 (3.3)	13 (21.3)	9 (14.8)	2 (3.3)	19 (31.1)	—
Chong and Robertson[20]	70	TAB +	5 (7.1)	—	—	—	—	—	—	5 (100)
		TAB–	60 (85.7)	—	—	—	—	—	—	—
Belilos et al[17]	33	TAB +	10 (30.3)	7 (70)	4 (40)	1 (10)	7 (70)	4 (0.4)	2 (20)	3 (30)
		TAB–	10 (30.3)	9 (90)	3 (30)	5 (50)	6 (60)	0 (0)	2 (20)	5 (50)
Totals		TAB + Total	414/976 (42.4)	313/409 (76.5)	146/409 (35.7)	155/409 (37.9)	194/351 (55.3)	146/351 (41.6)	91/287 (31.7)	125/332 (37.7)
		TAB– Total	531/976 (54.4)	308/471 (65.4)	68/471 (14.4)	160/471 (34.0)	121/347 (34.9)	113/347 (32.6)	55/248 (22.2)	142/286 (49.7)

PMR, Polymyalgia Rheumatica.

Table 4. Mean TAB Length

		TAB +		TAB–	
	n	n	Mean Length (cm)	n	Mean Length (cm)
Duhaut et al[19]	292	207	—	85	—
Quinn et al[13]	185	58	—	124	—
Thomassen et al[14]	143	34	0.9	99	0.99
Bowling et al[16]	129	17	1.08	102	1.01
Chew et al[18]	101	20	1.08	78	1.12
Chmelewski et al[11]	98	30	2.44	68	1.84
Agard et al[21]	80	56	—	24	—
Stuart[10]	75	14	—	61	—
Chong and Robertson[20]	70	5	—	60	—
Pieri et al[15]	55	3	—	47	—
Cristaudo et al[1]	50	2	—	47	—
Lenton et al[12]	44	7	—	37	—
Belilos et al[17]	33	10	1.68	10	1.2
Weighted average	(n = 1355)	(n = 463)	1.45 cm (n = 111)	(n = 842)	1.182 cm (n = 393)

Table 5. Steroid Treatment

	Received Steroid Prebiopsy	Steroids Started Postbiopsy	Steroids Continued Postbiopsy*	Steroids Stopped Postbiopsy
TAB +	291/313 (93.0%)	41/146 (28.1%)	371/405 (91.6%)	0/31 (0%)
TAB–	257/406 (63.3%)	28/343 (8.2%)	378/718 (52.6%)	145/655 (22.1%)

*Continued prebiopsy group includes patients who received prebiopsy steroids and were continued, as well as those who were not documented as receiving prebiopsy steroids, but were said to have "continued." Cristaudo et al[1] reported two positive TAB and five negative TAB patients receiving steroids for 6 months, while 41 patients (all TAB negative) were tapered within 2 weeks (was not included in Table 5 as steroid treatment was dictated by clinical response at the 2-week mark and not TAB).

6–24 months, and 69 (63%) received steroid treatment for more than 24 months.

There was no significant difference between TAB+ and TAB– groups for steroid duration in the less than 6 month ($p = 0.60$), 6–24 month ($p = 0.60$), or more than 24 month ($p = 0.64$) groups.

ACR Score

ACR scores were reported in 6 studies (Table 2); however, only three studies reported ACR scores between TAB+ and TAB– groups (Table 7).

Complications

In total, five studies commented on surgical complications. Four studies[15,16,18,20] reported on the wrong tissue being sampled, while Cristaudo et al[1] reported one facial nerve injury. There was no reporting on hematoma, wound healing complications, or alopecia. Interestingly, only studies led by surgeons reported on surgical complications.

Table 6. Steroid Treatment Duration

	<6 months	6–24 months	>24 months
TAB +	50/301 (16.6%)	47/301 (15.6%)*	198/301 (65.8%)*
TAB–	29/156 (18.6%)	21/109 (19.3%)*	69/109 (63.3%)*

*Bowling et al[16] reported 17 TAB positive and 89 TAB negative patients receiving steroid treatment >6 weeks, but did not break down into 6 months or 24 months. Lenton et al[12] reported seven TAB positive and 16 TAB negative patients receiving treatment >6 months, but did not go into further detail. Both were excluded from Table 6 for these reasons. Pieri et al[15] was excluded from the >6-month TAB negative group, but included in the TAB positive steroid duration because further detail was provided. In total 293 TAB positive and 119 TAB negative patients were reported on. The denominator 301, 156, and 109 was derived by adding all n of studies that reported on steroid duration.

DISCUSSION

Although a positive TAB is considered diagnostic of GCA and can be effective at guiding management, there are clinical scenarios where a TAB may not be advisable. For example, if the patient already meets ACR diagnostic criteria for GCA, then a TAB is superfluous and carries unnecessary surgical risk. Moreover, the patient is often treated based on clinical presentation regardless of TAB result.[2] Thirteen studies herein reported reflect that clinicians do not alter steroid duration based on TAB result.[1,10–21]

Prebiopsy Steroids

Our study found that the majority of patients (76%) received steroids before biopsy.[1,10–21] TAB+ patients were more likely to be treated with steroids prebiopsy than TAB– patients. This discrepancy in steroids prebiopsy between TAB+ and TAB– patients may be due to low clinical suspicion of a GCA diagnosis as TAB– patients may have less severe symptoms. Perhaps physicians are hesitant to initiate steroid management and consequently expose patients to side effects without having a confirmatory diagnostic test. It is also possible that TAB is being performed in patients experiencing vague symptoms (eg, headache, fever, elevated ESR) for whom clinical suspicion is low; however, an alternative diagnosis is unknown. Furthermore, studies had to specifically state if patients were taking steroids before biopsy (considered "started prebiopsy"). Many studies reported treatment continuation following biopsy ("continued steroid treatment post biopsy") but did not specify how many patients this applied to.

Despite this, British Society for Rheumatology guidelines recommend corticosteroid treatment initiation

Table 7. TAB−/TAB+ ACR Scores

Study		n	ACR (Patients with Available Info) ≤1	2	≥3	Overall Study TAB Positivity Rate (%)
Quinn et al[13]	TAB +	53	0	16	37	58 (100)*
	TAB−	119	24	57	38	0
Agard et al[21]	TAB +	80	0	0	80	56 (70%)
	TAB−	0	0	0	0	0
Belilos et al[17]	TAB +	10	0	0	10	10 (100%)
	TAB−	10	—	—	7	0

*Quinn et al[13] reported 58 positive TABs and 124 negative TABs and three failed TABs but did not have enough information to include ACR score on 10 of them (an additional three TABs were unsuccessful), resulting in a total of 172 ACR scores and more positive TABs than ACR scores.

immediately on suspicion of GCA to prevent serious complications such as blindness. Physicians who request a TAB for a patient presumably suspect a diagnosis of GCA. Thus, the low prevalence of TAB− patients on prebiopsy steroids is incongruent with British Society for Rheumatology guidelines.

ACR Score and Steroid Treatment

Quinn et al[13] reported on 75 patients with a prebiopsy ACR score of three or greater. That is, all 75 patients met the diagnostic criteria for GCA even before a TAB was performed.[13] In this scenario, it is debatable if TAB added any significant information, as the patients with an ACR score of 3 or more (sensitivity of 93% and specificity of 91%)[3] have ample evidence to continue with steroid treatment, and thus the TAB result may well be ignored. Additionally, in the Quinn et al[13] study, all 24 (100%) of the patients that had an ACR score of less than one on admission went on to have a negative TAB. When the ACR score is zero or four, the TAB result appears to have no impact on management. In our review, 81% of the patients with a score of 3 or more were treated for GCA, whereas only 37 of these were positive (49%). Of the 119 patients with an ACR score less than 3 and a negative TAB, 66 patients (55%) were still managed with steroids.

Bowling et al reported similar findings.[16] In their study, 100% of patients with an ACR of 3 or more had a positive TAB, while 84 of 89 (94%) that had a negative TAB also had an ACR score of 3 or more. Of the 89 TAB− patients, only eight (8%) had their steroid dose reduced at 6 weeks, suggesting that their clinical picture had a greater impact on treatment than a negative TAB. Furthermore, Bowling et al was unable to find a significant difference in steroid management between the TAB+ and TAB− groups.[16] Chew et al had similar results, reporting that 100% of patients that had a positive TAB already had an ACR score of 3 or more, and thus the procedure added nothing to their treatment.[18]

Logically, a patient presenting with an ACR score of 1 or less should rarely be considered for TAB due to low clinical suspicion. On the other end of the spectrum, patients with an ACR score of three or more should not routinely be offered a TAB, as they already meet the diagnostic criteria and steroid treatment is dictated by the patient's clinical presentation regardless of TAB result. Therefore, the most appropriate situation to conduct a TAB is when a patient presents with an ACR score of two. In this case, a TAB could influence management, as a positive TAB would result in an additional ACR criteria being met, increasing a patient's ACR score to three, which meets the diagnostic threshold for GCA. However, Cristaudo et al[1] found that out of 10 patients that had a prebiopsy score of 2, TAB was negative and did not result in a change of treatment for these patients. This study did not explicitly describe the steroid treatment further. Steroid treatment duration in this study was dictated by patient response to treatment at 2 weeks.

Treatment Duration between TAB Positive and Negative Patients

The British Society for Rheumatology recommends initiating a tapering regimen of 12–18 months once remission of symptoms has been maintained, to prevent GCA relapse. The tapering regime can often lead to prolonged steroid use, which is consistent with our results as more than 60% of patients from both TAB+ and TAB− groups were still steroid dependant at 24 months. Methotrexate can be considered in patients requiring continued treatment but experiencing glucocorticoid toxicity; however, this alternative treatment was not reviewed as part of this study.

Regarding steroid duration, one would expect that TAB+ patients would be treated for longer. However, we found very little difference between TAB+ and TAB− patients with respect to the duration of treatment (<6 months, 6–24 months, >24 months). Indeed, a higher proportion of TAB− patients received steroid treatment past 6 months[(90/109 (83%)] than TAB+ patients [245/301(81%)]. Due to the heterogeneity in the reporting of steroid duration, it is difficult to say if this trend would be observed in a greater sample size. Confounding variables, such as a TAB+ patient on steroid sparing treatment due to glucocorticoid toxicity, could also alter results.

Treatment Duration Dilemma

Treatment of GCA should begin upon clinical suspicion, and should be tapered due to the side effects of steroid treatment (eg, depression, insomnia, osteoporosis, immunosuppression, and weakness)[23] when GCA symptoms remit and ESR returns to normal.[24] As there are no specific tapering guidelines, a clinician must balance the side effects of steroids against the patient's improving GCA symptoms, while also monitoring inflammatory markers such as C- reactive protein and ESR. Our systematic review showed TAB+ and TAB− patients received similar duration

of steroids, suggesting that TAB result does not impact treatment length.

Postbiopsy Steroids

TAB+ patients were more likely than TAB– patients to be continued on steroids following biopsy [92% versus 56% ($P < 0.001$)]. A small percentage (8%) of TAB– patients began steroids despite a negative biopsy. This finding could be explained by the known false negative rate of the procedure, prompting physicians with a high clinical suspicion to initiate steroid therapy despite a negative TAB result. Despite the reported specificity of TAB nearing 100%, 8% of TAB+ patients did not pursue treatment. Perhaps their symptoms resolved from the treatment received before biopsy and a decision was made to discontinue steroids. Of the TAB– patients, only 22% of patients were reported to have stopped steroids postbiopsy.

Complications May Be More Common than Assumed

While physicians may fear committing a patient to an unnecessarily long course of steroid treatment without TAB confirmation, they may also be underestimating the risks of TAB. The prevalence of TAB procedure complications is not well documented; however, one study reported an unintended vein and peripheral nerve biopsy frequency of 2.5%.[25]

In a recent survey of Canadian plastic surgeons, 42% reported having had a complication related to TAB, with 35% of these being bleeding or hematoma.[26] Only 4% of complications were facial nerve injury, suggesting it to be one of the less common complications. These rates may be further underestimated, as the survey also found that only 14% of surgeons follow up on their patients, with the majority of follow-up conducted by the referring rheumatologist. Further research is needed to confirm the true rate of complications, but complications from TAB may be more prevalent than what is currently assumed.

Specialty of Study Author Correlated with Positivity Rate

When reviewing the medical specialty of the authors of the included studies, the studies with the five lowest TAB positivity rates were conducted by surgical specialties, while five out of six studies with the highest positivity rates were conducted by internal medicine or rheumatology specialties. This could be due to differing referral patterns of GCA patients at different centers. Cefai et al[27] found that 31% of TABs requested by rheumatologists were positive, whereas only 14% of TABs requested by other physicians were positive. A center where rheumatologists are the predominant referring physician could have a higher positivity percentage, as this specialty is historically more accurate at requesting TABs that go on to be positive.[26] Referring physician datum was not collected in our study, as it was not reported. Only studies conducted by surgical specialties included information on complications, which may be indicative of the differing perspectives across specialties.

The strengths of our study include adherence to the PRISMA guidelines for systematic reviews, and the rigorous data collection and reporting of baseline patient symptoms (eg, headache), which allows us to gain further insight into diagnosing GCA. Additionally, the large number of patients in the pooled analysis is another strength.

There are limitations to this study. First, the methods for steroid use reporting were quite heterogeneous amongst studies, making comparisons difficult. Furthermore, nonsteroid treatments for GCA such as methotrexate may skew results when comparing treatment duration. Finally, the lack of reported complications in the literature limited our ability to fully analyze the risks of TAB procedures. Future research should be done on TAB complications to determine the true morbidity of performing this procedure.

CONCLUSIONS

Clinicians involved in caring for patients with suspected GCA must make informed decisions on the trade-off of invasive testing, such as TAB. TAB is an invasive procedure that is unnecessary when a clinical diagnosis of GCA can be made before biopsy. In this systematic review, TAB results did not appear to impact steroid duration, raising the question as to whether TAB has a viable role in GCA management.

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