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2022 American College of Rheumatology-EULAR Classification Criteria for Giant Cell Arteritis

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Collaborators: We propose to list and designate all the site investigators and key personnel as "collaborators" as per Medline designation. This means their names are searchable on Medline. This is an important method to appropriately recognize the work of the many co-investigators of this study and is consistent with approaches taken by major journals for such work. A full list of collaborators will be provided for publication per each journal's format.

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Conflicts of Interest

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Key words

Vasculitis, giant cell arteritis, large-vessel vasculitis, classification

Word count: 2,859

Key messages: Please summarize the key points of your article in a total of up to 5 bullet points, structured under the following question headings:

What is already known about this subject?

- The widespread use of vascular imaging in clinical practice has expanded the clinical spectrum of large-vessel vasculitis (LVV) and exposed limitations of the 1990 American College of Rheumatology (ACR) classification criteria for giant cell arteritis (GCA).

What does this study add?

- This study provides new data-driven classification criteria for GCA derived from an international cohort of patients. These criteria reflect current clinical practice, classify a wider clinical phenotype of the disease with excellent performance characteristics, and incorporate findings from non-invasive and advanced vascular imaging techniques.

How might this impact on clinical practice or future developments?

- The new classification criteria for GCA will be useful in research settings for investigators to differentiate cases of GCA from similar types of vasculitis.

ABSTRACT (248/250 words)

Objective: To develop and validate updated classification criteria for giant cell arteritis (GCA).

Methods: Patients with vasculitis or comparator diseases were recruited into an international cohort. The study proceeded in six phases: i) Identification of candidate items; ii) Prospective collection of candidate items present at the time of diagnosis; iii) Expert panel review of cases; iv) Data-driven reduction of candidate items; v) Derivation of a points-based risk classification score in a development dataset; vi) Validation in an independent dataset.

Results: The development dataset consisted of 518 cases of GCA and 536 comparators. The validation dataset consisted of 238 cases of GCA and 213 comparators. Age ≥ 50 years at diagnosis was an absolute requirement for classification. The final criteria items and weights were: positive temporal artery biopsy or temporal artery halo sign on ultrasound (+5); erythrocyte sedimentation rate ≥ 50 mm/hour or C-reactive protein ≥ 10mg/L (+3); sudden visual loss (+3); and morning stiffness in shoulders or neck, jaw or tongue claudication, new temporal headache, scalp tenderness, temporal artery abnormality on vascular examination, bilateral axillary involvement on imaging, and FDG-PET activity throughout the aorta (+2 each). A patient could be classified as GCA with a cumulative score of ≥ 6 points. When these criteria were tested in the validation dataset the model area under the curve was 0.91 (95%CI: 0.88-0.94) with a sensitivity of 87.0% (95%CI: 82.0-91.0%) and specificity of 94.8% (95%CI: 91.0-97.4%).

Conclusion: The 2022 ACR-EULAR GCA Classification Criteria are now validated for use in clinical research.

INTRODUCTION

Giant cell arteritis (GCA), formerly known as temporal arteritis, is the most common form of systemic vasculitis in patients aged ≥ 50 years [1]. GCA is defined by granulomatous arteritis that affects large and medium-sized blood vessels with predisposition to affect the cranial arteries [2]. Common presenting features of the disease include headache, constitutional symptoms, jaw claudication, scalp tenderness, visual disturbances, and elevated inflammatory markers [3].

In 1990, the American College of Rheumatology (ACR) endorsed classification criteria for GCA [4]. These criteria were established before the widespread use of non-invasive and advanced vascular imaging modalities, which have become increasingly incorporated in the clinical assessment of GCA. Vascular ultrasound can be used to diagnose GCA, and depending on the clinical setting, a non-compressible 'halo' sign of a temporal ± axillary artery may replace the need for temporal artery biopsy (TAB) [5–8]. Moreover, vascular imaging has demonstrated that arterial involvement in GCA is not exclusively confined to the cranial arteries [9,10] and can commonly affect the aorta and primary branches in a pattern similar to Takayasu's arteritis (TAK) [11,12].

The limitations of the ACR 1990 criteria for GCA have become more apparent in the conduct of recent clinical trials and other research studies, in which investigators typically modify the 1990 ACR criteria to reflect modern practice [6,13,14]. Notably, the 1990 ACR criteria focus mostly on cranial features of GCA and do not perform well in classifying patients with disease predominantly affecting the larger arteries. The 1990 ACR criteria were derived using comparator populations which included many patients with small-vessel vasculitis, a form of vasculitis that is not typically difficult to differentiate from GCA. In addition, the 1990 ACR criteria for GCA followed the "number of criteria" rule, which considered each criterion to have equal weight as a classifier for the disease. Since then, methodological advances in classification criteria have allowed movement towards weighted criteria with threshold scores that improve performance characteristics [15,16].

This paper outlines the development and validation of the revised ACR-EULAR-endorsed classification criteria for GCA.

MATERIALS AND METHODS

An international Steering Committee comprising clinician investigators with expertise in vasculitis, statisticians, and data managers was assembled to oversee the overall development of classification criteria for primary vasculitis [17]. A detailed and complete description of the methods involved in the development and validation of the classification criteria for GCA is located in the **Supplementary Materials 1**. Briefly, the Steering Committee implemented a six-stage plan using data-driven and consensus methods to develop the criteria:

Stage One: *Generation of candidate classification items for the systemic vasculitides.* Candidate classification items were generated by expert opinion and reviewed by a group of vasculitis experts across a range of specialties using nominal group technique.

Stage Two: *Diagnostic and Classification Criteria in Vasculitis (DCVAS) prospective observational study.* A prospective, international multi-site observational study was conducted. Ethical approval was obtained from local ethics committees. Consecutive patients representing the full spectrum of vasculitides were recruited from academic and community practices. Patients were included if they were 18 years or older and had a diagnosis of vasculitis or a condition that mimics vasculitis (e.g., infection, malignancy, atherosclerosis). Patients with GCA could only be enrolled within 2 years of diagnosis. Only data present at diagnosis was used to develop the classification criteria.

Stage Three: *Expert review to derive a gold standard-defined set of cases of large-vessel vasculitis (LVV).* Experts in vasculitis from a wide range of geographical locations and specialties reviewed all submitted cases of vasculitis and a random selection of vasculitis mimics. Each reviewer was asked to review approximately 50 submitted cases to confirm the diagnosis and to specify the degree of certainty of their diagnosis as follows: very certain, moderately

certain, uncertain, or very uncertain. Only cases agreed upon with at least moderate certainty by two reviewers were retained for further analysis.

Stage Four: *Refinement of candidate items specifically for LVV.* The Steering Committee conducted a data-driven process to reduce the number of candidate items of relevance to cases and comparators for LVV. Density plots were assessed to study age distribution at diagnosis and symptom onset for GCA and TAK. Absolute age requirements versus incorporation of age as a candidate criteria item was considered. Items related to the vascular physical examination, vascular imaging, arterial biopsy, and laboratory values were combined or eliminated based on consensus review. Items were selected for exclusion if they had i) prevalence of <5% within the data set, and/or ii) they were non-clinically relevant for classification criteria (e.g., related to infection, malignancy, or demography). Low-frequency items of clinical importance could be combined, when appropriate. Patterns of vascular imaging findings detected by vascular ultrasound, angiography, or positron emission tomography were defined by k-means clustering [18].

Stage Five: *Derivation of the final classification criteria for GCA.* The DCVAS dataset was split into development (70%) and validation (30%) sets. Comparisons were performed between cases of GCA and a randomly-selected comparator group in the following proportions: TAK – 33.5%; other vasculitides that mimic GCA and TAK (isolated aortitis, primary central nervous system vasculitis, polyarteritis nodosa, Behçet's disease, and other LVV) – 33.4%; and other diagnoses that mimic LVV (e.g., atherosclerosis, unspecific headache) – 33.1%. LASSO (least absolute shrinkage and selection operator) logistic regression was used to identify predictors from the dataset and create a parsimonious model including only the most important predictors [19]. The final items in the model were formulated into a clinical risk-scoring tool with each factor assigned a weight based on its respective regression coefficient. A threshold was identified for classification, which best balanced sensitivity and specificity.

Stage Six: *Validation of the final classification criteria for GCA.* Performance of the new criteria was validated in an independent set of cases and comparators.

Performance of the final classification criteria was examined in specific subsets of patients with GCA using data from the combined development and validation sets to maximize sample sizes for the subgroups. Patients were studied according to different disease subtypes (biopsy-proven GCA and large-vessel GCA) and regions of the world (North America, Europe) where clinical strategies to assess GCA are known to differ [20]. Biopsy-proven GCA was defined as definite vasculitis on TAB reported by the submitting physician and large-vessel GCA (LV-GCA) was defined as vasculitic involvement of the aorta and branch arteries on either angiography (computed tomography, magnetic resonance, or catheter-based angiography), ultrasound or PET, without vasculitis on TAB. Comparison was made between the measurement properties of the new classification criteria for GCA and the 1990 ACR Classification Criteria in the validation dataset. Performance characteristics of the criteria were also tested in patients with TAK versus GCA diagnosed between the ages of 50-60 years.

RESULTS

Stage One: Generation of candidate classification items for the systemic vasculitides

The Steering Committee identified over 1000 candidate items for the DCVAS Case Report Form (see **Supplementary Materials 2**).

Stage Two: DCVAS prospective observational study

Between January 2011 and December 2017, the DCVAS study recruited 6991 participants from 136 sites in 32 countries. Information on the DCVAS sites, investigators, and participants are listed in **Supplementary Materials 3, 4, and 5**.

Stage Three: Expert review methodology to derive a gold standard-defined final set of cases of LVV

The LVV expert panel review process included 56 independent experts who reviewed vignettes derived from the Case Report Forms of 2131 cases submitted with a diagnosis of either LVV (1608, 75.5%), another type of vasculitis (118, 5.5%), or a mimic of vasculitis (405, 19.0%). Characteristics and the list of expert reviewers are shown in **Supplementary Materials 6 & 7**. A sample vignette and the LVV expert panel review flow chart are shown in **Supplementary Materials 8 & 9**. A total of 1695 (80%) cases passed the main LVV process. An additional 373 cases of LVV and comparators, confirmed during a previous review process to derive the classification criteria for AAV, were also included. In total, after both review processes, 2068 cases were available for Stage Four and Five analyses. The submitting physician diagnosis of GCA was confirmed in 913/1137 (80.3%) cases after both expert panel reviews. The reasons for exclusion were diagnosis of GCA categorized as “uncertain” or “very uncertain” during panel review (n=187) or change in diagnosis during panel review to another type of vasculitis (isolated aortitis, TAK, other vasculitides) (n=11) or to a comparator disease (n=26). An additional 29 patients who were not initially diagnosed as GCA by the submitting physician were diagnosed as GCA after panel review and DCVAS steering committee member adjudication. In total, 942 cases of confirmed GCA were available for analysis. To balance the number of cases of GCA with the number of available comparators, 756 cases of GCA were randomly selected for subsequent analysis.

Stage Four: Refinement of candidate items specifically for GCA

Only 7 out of 942 patients with GCA (<1%) were diagnosed at age < 50 years (see **Supplementary Materials 10** for the distribution of "age at diagnosis" in patients with LVV, and the similar distribution of "age at symptom onset"). Therefore, age at diagnosis ≥ 50 years was considered an absolute requirement to classify GCA. Cluster analyses of vascular imaging data identified bilateral axillary involvement and diffuse FDG uptake throughout the aorta on PET as specific imaging patterns for GCA (see **Supplementary Materials 11 & 12)**. These imaging patterns were tested as potential classifiers.

Following a data-driven and expert consensus process, 72 items of the DCVAS Case Report Form were retained for regression analysis including 32 demographic and clinical, 14 laboratory items (including values of C-reactive protein (CRP) and erythrocyte sedimentation rates (ESR) divided into 5 categories each), 14 imaging (13 composite) items, 11 vascular examination items (5 composite, and upper extremity blood pressure divided into 6 categories), and 1 biopsy item (**Supplementary Materials 13).**

Stage Five: Derivation of the final classification criteria for GCA

A total of 1,505 cases were selected for analysis (756 GCA and 749 comparators), of which 1054 (70%) were in the development dataset (518 GCA and 536 comparators), and 451 (30%) cases in the validation dataset (238 GCA and 213 comparators). Table 1 describes the demographic and clinical features of patients with GCA and the comparators. The cases of GCA were recruited from Europe (n=796); North America (n=112); Oceania (n=18), and Asia (n=16). Clinical diagnoses assigned to patients in the comparator group are detailed in **Supplementary Materials 14**.

LASSO regression of the previously selected 72 items yielded 27 independent predictor variables for GCA, **Supplementary Materials 15A**. Each predictor variable was then reviewed for inclusion by the DCVAS Steering Committee, based on their odds ratios and specificity to GCA, to ensure face validity. The variables "definitive vasculitis on TAB" and "halo sign on TA ultrasound" were found to dominate the model as quite strong predictors of GCA (see **Supplementary Materials 16A** for cluster plots showing almost a perfect overlap between the

diagnosis of GCA and positive TAB or halo sign on TA ultrasound). Therefore, for the remaining variables to have discriminatory value, both of these items were removed from the model, combined into one composite item "vasculitis on TAB or halo sign on TA ultrasound" and given a risk score of one point below the final threshold set to classify GCA to maintain face validity. The variables "jaw claudication" and "tongue claudication" were combined into one item, as were the variables "maximum ESR (>50 mm/hr)" and "maximum CRP (>10 mg/L)". Although the variable "new persistent headache - occipital or cervical" showed important statistical significance, it decreased the overall specificity of the model when testing their final performance characteristics (cases vs comparators) and it was, therefore, also removed. Weighting of the individual criterion included in the model was based on logistic regression fitted to the remaining 9 selected predictors (**Supplementary Materials 17A**).

Stage Six: Validation of the final classification criteria for GCA

Using a cut-off of ≥ 6 in total risk score in the validation dataset (see **Supplementary Materials 18A** for different cut-points), the sensitivity was 87.0% (95%CI: 82.0-91.0%) and specificity was 94.8% (95%CI: 91.0-97.4%). The area under the curve (AUC) for the model was 0.91 (95%CI: 0.88-0.94) (**Supplementary Materials 19A**). The final 2022 ACR-EULAR classification criteria for GCA are presented in **Figure 1** (for the slide presentation versions, see Supplementary Figure 1, available on the *Arthritis & Rheumatology* website at http://onlinelibrary.wiley.com/doi/XXXXX).

The performance characteristics of the criteria in different subsets of patients with GCA are shown in **Table 2 and Supplementary Materials 20A**. Biopsy-proven GCA showed a sensitivity of 100% (95%CI: 99.0-100.0%) and a specificity of 94.9% (93.1-96.4%), and large-vessel GCA a sensitivity of 55.7% (95%CI: 46.5-64.6%) and a specificity of 94.9% (93.1-96.4%). Sensitivity of the criteria in North America was 77.8% (95%CI: 67.8-85.9%) and in Europe was 87.2% (95%CI: 84.4-89.7%). Specificity in North America was 95.6% (95%CI: 90.6-98.4%) and in Europe was 88.8% (95%CI: 84.9-92.0%).

When the 1990 ACR classification criteria for GCA were applied to the DCVAS validation dataset, the criteria performed poorly due to low sensitivity (80.3%, 95%CI: 74.6-85.1%) but retained good specificity (92.5%, 95%CI: 88.1-95.7%). In particular, the 1990 ACR criteria had poor sensitivity for patients with large-vessel GCA (37.1%, 95%CI: 28.6-46.2%).

Age restrictions are absolute requirements for the 2022 ACR-EULAR Criteria for GCA (≥ 50 years at diagnosis) and TAK (≤ 60 years at diagnosis). However, out of the 70 patients with GCA diagnosed between the ages of 50-60 years, 44 (62.9%) met the new GCA classification criteria, 9 (12.9%) met the new TAK classification criteria, and only 2 (2.9%) met both the new GCA and TAK classification criteria (**Supplementary Materials 21**).

DISCUSSION

Presented here are the final 2022 ACR-EULAR GCA Classification Criteria. A six-stage approach was used, underpinned by data from the multinational, prospective DCVAS study and informed by expert review and consensus at each stage. The comparator group for developing and validating the criteria were other vasculitides and conditions that mimic GCA where discrimination from GCA is difficult, but important. In the validation set, the new criteria had a sensitivity of 87.0% (95%CI: 82.0-91.0%) and specificity of 94.8% (95%CI: 91.0-97.4%). These are the official final values that should be quoted when referring to the criteria. The sensitivity and specificity values calculated in the development set were very similar, providing reassurance that the statistical methods avoided overfitting of models. The new criteria incorporate modern imaging techniques and have excellent specificity and sensitivity within a large, international cohort of patients with GCA. The criteria were designed to have face and content validity for use in clinical trials and other research studies.

These criteria are validated and intended for the purpose of *classification* of vasculitis and are not appropriate for use to establish a *diagnosis* of vasculitis. The aim of the classification criteria is to differentiate cases of GCA from similar types of vasculitis in research settings [21]. Therefore, **the criteria should only be applied when a diagnosis of large- or medium-vessel vasculitis has been made and all potential "vasculitis mimics" have been excluded**. The exclusion of mimics is a key aspect of many classification criteria including those for Sjögren's syndrome [22] and rheumatoid arthritis [16]. The 1990 ACR Classification Criteria for vasculitis perform poorly when used for diagnosis (i.e., when used to differentiate between cases of vasculitis versus mimics without vasculitis) [23], and it is expected that the 2022 criteria would also perform poorly if used inappropriately as diagnostic criteria in people whom alternative diagnoses, such as infection or other non-vasculitis inflammatory diseases, are still being considered.

The 2022 ACR-EULAR GCA Classification Criteria are the result of an incredibly large world-wide effort, in which an extensive set of data was collected from >1000 patients with the submitted diagnosis of GCA. These criteria reflect current clinical practice, integrating different investigative methods (e.g., temporal artery biopsy, ultrasound, angiography, positron emission tomography) from various countries and medical specialties. Real cases of GCA and comparators were reviewed by a wide range of experts in vasculitis to establish a

non-biased diagnostic reference to derive the criteria. Advanced statistical methods, including LASSO logistic regression and cluster analyses, were applied which facilitated testing for different covariates of interest, namely specific patterns of vasculitic involvement in imaging. Modern classification techniques, using weighted criterion with threshold scores were used allowing for more discriminatory items to factor more heavily in disease classification.

When compared to the original 1990 ACR Classification Criteria for GCA, the new ACR-EULAR GCA Classification Criteria demonstrated greater sensitivity while maintaining similar specificity as the 1990 criteria. In particular, the new criteria were able to correctly classify more patients with the LV-GCA subtype, in whom the sensitivity of the 1990 ACR criteria was only 37.1%. Unlike the 1990 ACR criteria, age ≥50 years at diagnosis is a mandatory requirement to classify GCA in the 2022 ACR-EULAR criteria. This age threshold included > 99% of patients with the reference diagnosis of GCA. The new criteria maintain good discriminative ability for patients diagnosed between the ages of 50-60 years, the interval where the absolute age requirements for the 2022 ACR-EULAR criteria for GCA and for TAK can overlap. A potential limitation of these criteria was the non-standardized acquisition of clinical and imaging data among patients with LVV and comparators (e.g., not all patients underwent vascular examination of the temporal arteries, PET was not available in many centers treating patients with LVV, and TAB and/or ultrasound was not performed in all patients with suspected GCA, etc.). However, this reflects existing differences in clinical practice, and the 11 items included in the criteria allow for a feasible evaluation of patients in any clinical setting. These criteria also provide flexibility for classifying a patient, regardless of the diagnostic assessment strategy employed by physicians. Definite vasculitis on TAB was defined by the submitting physician and did not undergo central review; approximately 20% of cases did not have specific histopathologic findings but were reported as “definitive vasculitis on TAB” alone. Most patients were recruited from Europe and North America with fewer patients from Asia and Oceania. The performance characteristics of the criteria should be further tested in other populations that were under-represented in the DCVAS cohort and may have different clinical presentations of GCA.

The 2022 ACR-EULAR Classification Criteria for GCA are the product of a rigorous methodologic process that utilized an extensive dataset generated by the work of a

remarkable international group of collaborators. These criteria have been endorsed by the ACR and EULAR and are now ready for use in clinical research.

Table 1. **Demographic and disease features of cases of giant cell arteritis and comparators**

	GCA n = 756	Comparators* n = 749	p-value
Demographics			
Mean age, years (SD)	72.2 (8.5)	44.6 (18.0)	<0.001
Female sex, n (%)	511 (67.6)	447 (59.7)	0.001
Clinical Features, n (%)			
Morning stiffness neck/torso	88 (11.6)	15 (2.0)	<0.001
Morning stiffness shoulders/ arms	174 (23.0)	23 (3.1)	<0.001
Sudden visual loss	102 (13.5)	29 (3.9)	<0.001
Jaw claudication	356 (47.1)	19 (2.5)	<0.001
Tongue claudication	21 (2.8)	1 (0.1)	<0.001
New persistent temporal headache	475 (62.8)	90 (12.0)	<0.001
Scalp tenderness	260 (34.4)	25 (3.3)	<0.001
Temporal artery abnormality on vascular examination[1]	354 (46.8)	35 (4.7)	<0.001
Investigations, n (%)			
Maximum ESR ≥ 50 mm/hour	558 (73.8)	291 (38.9)	<0.001
Maximum CRP ≥ 10 mg/L	683 (90.3)	445 (59.4)	<0.001
Definitive vasculitis on temporal artery biopsy	335 (44.3)	1 (0.1)	<0.001
Halo sign on temporal artery ultrasound	211 (27.9)	1 (0.1)	<0.001
Bilateral axillary involvement on imaging[2]	57 (7.5)	12 (1.6)	<0.001
FDG-PET activity throughout aorta[3]	52 (6.9)	9 (1.2)	<0.001

GCA: giant cell arteritis; SD: standard deviation; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; FDG-PET: (18F) fluorodeoxyglucose-positron emission tomography.

* Diagnoses of comparators for the classification criteria for giant cell arteritis included Takayasu's arteritis (n=251), Behçet's disease (n=133), polyarteritis nodosa (n=74), isolated aortitis (n=16), primary central nervous system vasculitis (n=16), LVV that could not be subtyped (n=9), other diseases that mimic LVV (n=250)

[1] Absent or diminished pulse, tenderness, or hard 'cord-like'.

[2] Bilateral axillary involvement: defined as damage (i.e., stenosis, occlusion, or aneurysm) on angiography (computed tomography, magnetic resonance, or catheter-based) or ultrasound, halo sign on ultrasound, or abnormal FDG uptake on PET.

[3] Descending thoracic and abdominal aorta.

Table 2. Performance Characteristics of the 2022 ACR-EULAR Classification Criteria for giant cell arteritis

Patients	N total (N GCA)	Sensitivity (95% CI)	Specificity (95% CI)	AUC (95% CI)
Development dataset	1054 (518)	84.8% (81.4 – 87.7%)	95.0% (92/8 – 96.7%)	0.90 (0.88 – 0.92)
Validation dataset	451 (238)	87.0% (82.0-91.0%)	94.8% (91.0 - 97.4%)	0.91 (0.88-0.94)
GCA subtypes				
Biopsy-proven GCA	1104 (355)	100.0% (99.0-100.0%)	94.9% (93.1-96.4%)	0.97 (0.97 - 0.98)
Large-vessel GCA	873 (124)	55.7% (46.5-64.6%)	94.9% (93.1-96.4%)	0.75 (0.71 - 0.80)

ACR: American College of Rheumatology; AUC: Area under the curve; CI: Confidence interval; EULAR: European Alliance of Associations for Rheumatology; GCA: giant cell arteritis.

GCA subtypes: biopsy-proven GCA (definite vasculitis on TAB); large-vessel GCA (involvement of the aorta and branch arteries on imaging, without vasculitis on TAB). Performance characteristics were tested in the subtypes using the combined development and validation datasets to maximize sample size.

N total (N GCA): N of total cases used in the model (number of cases of GCA)

Figure 1. 2022 American College of Rheumatology-EULAR Classification Criteria for Giant Cell Arteritis

Considerations when applying these criteria:

- These classification criteria should be applied to classify the patient as having giant cell arteritis when a diagnosis of medium- or large-vessel vasculitis has already been made.
- Alternate diagnoses mimicking vasculitis should be excluded prior to applying the criteria.

2022 ACR-EULAR Classification Criteria for Giant Cell Arteritis	
Criteria absolute requirement	
Age ≥ 50 years at time of diagnosis	
Criteria Items	
Clinical Features	
Morning stiffness in shoulders/neck	**+2**
Sudden visual loss	**+3**
Jaw or tongue claudication	**+2**
New temporal headache	**+2**
Scalp tenderness	**+2**
Abnormal examination of the temporal artery[1]	**+2**
Investigations	
Laboratory	
Maximum ESR ≥ 50mm/hour or maximum CRP ≥ 10mg/L[2]	**+3**
Biopsy / Imaging Findings	
Positive temporal artery biopsy or halo sign on temporal artery ultrasound[3]	**+5**
Bilateral axillary involvement[4]	**+2**
FDG-PET activity throughout aorta[5]	**+2**
Sum the scores for all items, if present. A score of ≥ 6 points is needed for the classification of giant cell arteritis	

1. Examination of the temporal artery showing absent or diminished pulse, tenderness, or hard 'cord-like'.
2. Maximum erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) values prior to initiation of treatment for vasculitis.
3. Presence of either definitive vasculitis on temporal artery biopsy or halo sign on temporal artery ultrasound. There are no specific histopathologic criteria to define definitive vasculitis on temporal artery biopsy. Presence of giant cells, mononuclear leukocyte infiltration, and fragmentation of the internal elastic lamina were independently associated with histopathologic interpretation of definite vasculitis in the DCVAS cohort [24]. Halo sign is defined by the presence of a homogenous, hypoechoic wall thickening on ultrasound [25].
4. Bilateral axillary involvement is defined as luminal damage (stenosis, occlusion, or aneurysm) on angiography (computed tomography, magnetic resonance, or catheter-based) or ultrasound, halo sign on ultrasound, or fluorodeoxyglucose uptake on positron emission tomography.
5. Abnormal fluorodeoxyglucose (FDG) uptake in the arterial wall (e.g., greater than liver uptake by visual inspection) throughout the descending thoracic and abdominal aorta on positron emission tomography (PET).

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We acknowledge the patients and clinicians who provided data to the DCVAS project.

It is our strong request to name and designate all of the clinical investigators and data science staff as “collaborators” per Medline’s process for this term. This is the appropriate approach to acknowledge their work and now a standard practice for large groups of investigators.

We are including the names of all the investigators and key study staff, including country and name of site institution, in online supplementary material common to the papers on classification of giant cell arteritis and Takayasu’s arteritis. We are acknowledging the expert panel reviewers in a similar fashion in the online supplementary material.

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