Assessment of Disease Activity in Large-vessel Vasculitis: Results of an International Delphi Exercise

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ABSTRACT. ***Objective.*** To arrive at consensus for candidate outcomes for disease activity assessment in large-vessel vasculitis (LVV) in clinical trials.

Methods. A Delphi survey including 99 items was circulated among international experts for 3 rounds.

Results. Fifty-seven items were accepted for both giant cell arteritis and Takayasu arteritis. Sixty-seven percent of experts voted to have a common approach for both diseases with additional disease-specific items such as weight loss, scalp tenderness/necrosis, morning stiffness, dizziness, visual symptoms, and imaging.

Conclusion. This study highlights similarities and differences in experts' perspectives for assessing clinical activity in LVV and may guide a consensus-driven core set of validated outcomes. (First Release September 1 2017; J Rheumatol 2017;44:1928–32; doi:10.3899/jrheum.161269)

Key Indexing Terms:
VASCULITIS TAKAYASU ARTERITIS GIANT CELL ARTERITIS
LARGE VESSEL OUTCOMES

Large-vessel vasculitis (LVV) is a rare disease mainly affecting the aorta and its primary branches[1,2,3]. LVV usually has a relapsing-remitting course leading to prolonged periods of seemingly "clinically inactive" disease during which arterial damage can still progress. In clinical practice, physicians managing cases of LVV combine subjective clinical data with fairly unreliable laboratory markers and imaging. A comprehensive review of the literature demonstrated that not only are there no widely accepted or standardized outcome tools in LVV, but also there are not even broadly accepted definitions of important outcomes such as "disease activity" or "response to therapy[4]."

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The OMERACT Vasculitis Working Group is advancing a research agenda that includes parallel projects to understand the perspectives and insight into outcomes of importance in LVV of (1) experienced physicians and investigators, and (2) patients[4]. An international Delphi exercise was conducted to identify items considered important when determining active disease status in LVV in clinical trials. Specifically, the Delphi aimed to determine (1) experts' consensus opinions on the disease domains/subdomains of importance to study in LVV, and (2) a preliminary set of outcomes and outcome instruments to use to identify key data on the domains. The ultimate goal of our project was to establish a core set of domains and validated outcome measures for use in clinical research in LVV. It has been argued that the 2 major types of LVV, giant cell arteritis (GCA) and Takayasu arteritis (TA), may not be distinct entities, but are part of a single disease spectrum[5,6]. Thus, the Delphi process also aimed to determine whether clinicians feel one common outcome measure could be used to assess disease activity in both GCA and TA.

MATERIALS AND METHODS

The Delphi survey was sent by e-mail to 317 experts in LVV who are involved in clinical research in vasculitis and/or attended academic vasculitis meetings (Appendix 1). Particular attention was paid to ensure inclusion of different geographic areas and medical specialties. Information was collected regarding participants' practice setting, specialty, country, and level of experience, measured by the number of cases they followed in their career with GCA and TA.

The following question was asked for multiple proposed items in the survey: "Should the following item be used to assess disease activity in TA/GCA in clinical trials?" The participants voted for GCA and TA separately. The first round included 99 items on a 5-point scale (strongly

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disagree, disagree, neutral, agree, and strongly agree), in addition to the option of saying "don't know." Items were chosen with the aim of being initially comprehensive, including items from published disease activity assessment tools [Birmingham Vasculitis Activity Score (BVAS), Indian Takayasu Arteritis Score (ITAS), Disease Extension Index in TA] or used by prior clinical investigations[4,7,8,9] (Supplementary Table 1, available with the online version of this article). Participants were given the option to give feedback and suggest other items in the first round. The 104 comments received from the participants were discussed by all investigators (SZA, HD, PAM) and it was decided that 7 items would be added in the subsequent rounds. Items accepted or rejected by > 70% of voters were not advanced to subsequent rounds. Sixty-two items were voted for GCA and 63 for TA in the second round and 24 items for GCA and 28 items for TA were voted in Round 3. The voting results of the participants who had seen > 10 cases (in each subtype of LVV) in their career were also analyzed and compared to the result of the less experienced participants.

RESULTS

The first, second, and third rounds were completed by 148, 111, and 108 participants from 23 countries, respectively. Experts represented multiple relevant medical specialties [rheumatology, (n = 75), internal medicine (n = 5), cardiology (n = 1) vascular surgery (n = 4), nephrology (n = 8), pediatric rheumatology (n = 6), ophthalmology (n = 5), and radiology (n = 4)]. The primary setting of the participants was academic (93%), and 61% had been working for more than 10 years.

Ninety-six participants had seen > 10 cases of GCA and 84 participants had seen > 10 cases of TA in their life; the results from these more experienced participants were carried through to the final round.

Items commonly accepted for both GCA and TA. Fifty-seven items were accepted for both GCA and TA. These items covered a wide range of manifestations (Table 1 and Table 2).

Items excluded for both GCA and TA. Many items were excluded for both diseases, including anorexia, arthritis, von Willebrand factor antigen, leukocyte count, fibrinogen levels, edema, pyoderma gangrenosum, digital ulcers, oral ulcers, gangrene, erythema nodosum, cardiomyopathy, bloody diarrhea, seizures, organic brain syndrome, dementia, peripheral and cranial neuropathy, psychosis, photophobia, respiratory findings and renal findings (other than rise in blood pressure). Among patient-reported outcomes, the Nottingham Health Profile, EQ-5D, and the Health Assessment Questionnaire (HAQ) were excluded. The physician-based assessments BVAS and ITAS were excluded for both diseases. Within imaging findings, only arterial wall enhancement was not accepted for both forms of vasculitis.

Items accepted only for GCA or TA. Items differently endorsed for GCA or TA are listed in Table 3.

"Can/should we develop 1 common outcome measure for TA and GCA?" Sixty-seven percent of experts voted for a common approach for GCA and TA, but also endorsed development of additional disease-specific instruments; 11% agreed with aiming to develop 1 set of outcome measures for both GCA and TA (without any modifications for GCA and TA); and 22% said that the 2 diseases were unsuitable for common outcome measures.

Differences between experienced and inexperienced investigators. There were many similarities among both the experienced and inexperienced groups. The differences for GCA were that interleukin 6 (IL-6) levels, dizziness, cranial neuropathy, HAQ, and a rise in creatinine were items considered important only according to the inexperienced participants, whereas fever, hemoglobin/hematocrit, cardiovascular (CV)

Table 1. Candidate outcome measures elements commonly accepted for both giant cell arteritis and Takayasu arteritis.

Category/Organ System	Specific Candidate Element
Constitutional	Fever > 38°C
	Fatigue
Laboratory abnormalities	Erythrocyte sedimentation rate
	C-reactive protein
	Hemoglobin/hematocrit
Vascular items	New bruit(s)
	New loss of pulse(s)
	New diminished pulse(s)
	Asymmetric blood pressure measurement
	Pulse inequality
	Extremity claudication
Gastrointestinal	Abdominal pain (vasculitic)
Musculoskeletal	Arthralgia
	Myalgia
Patient-reported outcomes	A general health-related outcome measure
	SF-36 (all components)
	Patient pain assessment
	Patient's global assessment
	Fatigue measurement instrument
Imaging*	CT angiography, PET-CT, MR angiography, ultrasound
Cardiovascular	Carotidynia
	Extremity hypoperfusion/threatened limb
	Chest pain: pericardial or angina
	New hypertension
	Other symptom attributed to vascular insufficiency
Renal	Rise in blood pressure (systolic/diastolic)
Ocular	Temporary vision loss (amaurosis fugax)
	Blurred vision
	Retinal vasculitis (thrombosis or aneurysm)
	New permanent visual loss
Neurological	Transient ischemic episodes
	Syncope
	Stroke
	New/worsened headache
	Hemiparesis, paraparesis
Physician-based assessments	Physician's global assessment
	Relapse (general definition)
	Vasculitis Damage Index
	Increase in glucocorticoid dose
	New/increased immunosuppressive medication
	DEI.Tak

*Different abnormalities on different imaging modalities were voted on separately. SF-36: Medical Outcomes Study Short Form-36; CT: computerized tomography; PET: positron emission tomography; MR: magnetic resonance; DEI.Tak: disease extent index for Takayasu arteritis.

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Table 2. Imaging findings by different modalities accepted as potential measures of disease activity for both giant cell arteritis and Takayasu arteritis.

Modality	Findings
CT angiography	Arterial stenosis
	Aneurysm
	Arterial wall thickening
	Arterial wall enhancement
PET-CT	Total uptake values
	Individual artery update values
	Relative uptake compared to liver
MR angiography	Arterial stenosis
	Aneurysm
	Arterial wall thickening
	Arterial wall enhancement
Ultrasound	Arterial stenosis
	Aneurysm
	Arterial wall thickening

CT: computerized tomography; PET: positron emission tomography; MR: magnetic resonance.

Table 3. Items accepted for only 1 form of large-vessel vasculitis.

Variables	Details
Giant cell arteritis	
Constitutional	Weight loss
Cutaneous	Scalp necrosis
	Scalp tenderness
Musculoskeletal	Morning stiffness
Ocular	Scotoma
	Diplopia
Imaging	Vascular ultrasound: halo sign*
Takayasu arteritis	
Imaging	Conventional catheter-based angiography
	Conventional catheter: stenosis
	Conventional catheter: aneurysm
Nervous system	Dizziness

* Vascular halo sign was only circulated in the first round because of a technical error. It was accepted for giant cell arteritis, but not for Takayasu arteritis.

items including new bruits, loss of pulse or inequality, carotidynia, stroke, hemiparesis, and Vasculitis Damage Index were items accepted only by the experienced participants. Inexperienced participants accepted only TA, IL-6, weight loss, European quality of life index, HAQ, and rise in creatinine. Experienced investigators accepted only arthralgia, myalgia, blurred vision, syncope, worsening in headache, and hemiparesis.

DISCUSSION

The results of this Delphi exercise may help future studies in outlining the range of candidate elements and subdomains to consider when advancing the development of outcome measures of disease activity in LVV in clinical trials. The items that were endorsed include manifestations from the CV, renal, gastrointestinal (GI), nervous, ocular, and musculoskeletal systems. The exclusion of the genitourinary and respiratory systems is consistent with previous publications in which these systems are not sites of LVV-related disease activity[10]. Not all the assessments of specific systems had the same "weight of importance" according to the experts. There was only 1 item in the GI (abdominal vasculitic pain) and renal (rise in blood pressure) sections that was accepted, whereas CV and nervous systems had markedly more items retained, as expected.

The results of this Delphi study demonstrate that most experts in the management of LVV agree that a large number of items for disease assessment in LVV were suitable for use in both GCA and TA, and that development of a common approach for disease assessment in both diseases would be appropriate. However, a set of additional disease-specific instruments for each disease was also recommended, with the potential to create 1 disease activity assessment tool for LVV, with minor modifications or supplemental measures for each type of LVV.

Our study has several strengths, including the wide variation of the experts regarding specialty and geographic site because physicians from 8 specialties and 23 countries on 4 continents contributed. Large cohorts of patients with LVV have demonstrated that there are variations among different ethnicities in terms of frequencies of disease characteristics for LVV. Therefore, the efforts to include a broad range of experts enhances the generalizability and reliability of these findings. However, about 90% of participants were from North America or Europe, providing a somewhat unbalanced international representation. This imbalance is also seen for the specialties, despite efforts to distribute the Delphi study to multiple specialties. Additionally, the vast majority of the participants were rheumatologists. Therefore, the results mostly reflect the perspectives of rheumatologists, indicative of how the care of patients with LVV is distributed across different specialties. Further, only some elements were evaluated by some specialists to ensure expertise was matched with a corresponding clinical aspect of disease. Another strength of our study was inclusion of an extensive list of different manifestations in the first round to allow for the wide group of experts to consider all reasonable options for disease assessment.

There are also potential limitations of our study to consider, including the definition of an expert in LVV being defined as having seen at least 10 patients with GCA or TA in their career. This number may be considered too low, especially compared to more prevalent diseases. However, because LVV are rare diseases, drawing the threshold for "expert" from a higher number would significantly reduce the number of investigators able to participate; notably, all participants had participated in prior activities within the

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vasculitis research community. In addition, the exclusion of some participants from the analysis is not a common approach for Delphi exercises; however, because a Delphi should only be performed by experts in the area, we took this additional step. Because of the epidemiological differences in LVV, an expert in GCA may not necessarily be experienced in TA and vice versa. Therefore, we limited the analysis to participants who were experienced in that area only, to increase the credibility of the results. This approach was planned as part of the analysis plan prior to the first round of the Delphi being initiated. Another limitation is the lack of a subset definition for "isolated aortitis"[11]; disease activity in this group of patients might require additional approaches to activity assessment.

Our study identified a set of important items to measure in a clinical trial in LVV, but all items are not required to be included in an activity index. There are many items and overlap among some proposed items; a data-driven statistical approach to item reduction will be necessary.

This Delphi exercise was an important step in achieving expert consensus opinion on items necessary to identify disease activity in LVV and these results will guide future work in outcome measure development in LVV. Further studies are planned to determine a core set of activity domains for use in clinical trials of GCA and TA.

ONLINE SUPPLEMENT

Supplementary material accompanies the online version of this article.

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APPENDIX 1.

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