MRI Features That Contribute to Decision-Making for Treatment of Capitellar OCD Lesions

An Expert Consensus Using the Delphi Method

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Background: Most healthcare providers utilize magnetic resonance imaging (MRI) to assist in diagnosing and treating osteochondritis dissecans (OCD) of the capitellum. However, consensus on imaging features that portend clinically relevant information in the care of these lesions has not been determined.

Purpose: To conduct a survey on the MRI features of a capitellar OCD that are salient for clinical decision-making using a classic Delphi protocol.

Study Design: A consensus statement.

Methods: Invitations to participate were sent to 33 healthcare providers identified as capitellar OCD experts. A classic 3-round survey method was used to gather agreement and consensus on the level of importance for clinical decision-making on 33 MRI features. A concise list of features that guide decision-making on the stability of an OCD lesion and the ability of an OCD lesion to heal with nonoperative care was also identified. Agreement and consensus were determined a priori as $\geq$66%.

Results: Of the 33 identified experts, 20 agreed to participate, and 17 (52%) completed all 3 rounds. Of the 33 MRI features evaluated, 17 reached agreement as important for clinical decision-making by the experts. Consensus was reached for a concise list of MRI features that were significant to decision-making (94%), suggestive of a stable lesion (100%), had the potential to heal with nonoperative treatment (94%), were suggestive of an unstable lesion (100%), and had low potential to heal with nonoperative treatment (88%).

Conclusion: This 3-round Delphi process produced consensus on clinically relevant MRI features that contribute to clinical decision-making for capitellar OCD. The results of this study will be used as the basis for an interrater reliability assessment of the identified salient features, creating the foundation for developing a reliable MRI assessment tool rooted in clinical experiences. The development of a standardized assessment of capitellar OCD is intended to improve clinical practice and patient outcomes.

Keywords: elbow; imaging; magnetic resonance; pediatric sports medicine

Osteochondritis dissecans (OCD) is "a focal idiopathic alteration of subchondral bone and/or its precursor with risk for instability and disruption of adjacent articular cartilage that may result in premature osteoarthritis,"[24] which occurs most commonly in the knee,[10] elbow,[9] and ankle.[11] Capitellar OCD lesions produce significant problems for athletes who develop them, especially those who participate in overhead sports or sports that require weight-bearing on their upper extremities.[2] Early and accurate identification

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is likely the best step in clinical care, as it promotes cartilage preservation and mitigates long-term sequelae.[1] While treatment of the lesions when seen early[17,18] or late[16,19] in the disease progression may be straightforward, there may be ambiguities and challenges to treating patients when they present with lesions in between these extremes.

Radiographs, computed tomography, and magnetic resonance imaging (MRI) are readily available diagnostic imaging modalities utilized in diagnosing and working these lesions. Radiographs are the preferred initial imaging modality for the confirmation of clinically suspected OCD lesions; however, radiographs and computed tomography lack information pertaining to the integrity of the overlying cartilage, making them insufficient for guiding the development of a care plan.[3,23,29] Thus, MRI has become the modality of choice to noninvasively determine an OCD lesion's severity and stability.[12,21,30] Several MRI classification systems for capitellar OCDs have been proposed, focusing predominately on fluid or signal intensity at the interface or surface of the lesion with cartilage changes.[7,13] However, the sensitivity and specificity of these systems with International Cartilage and Regeneration and Joint Preservation Society grades are less than ideal,[28] and these classifications have not been assessed against the ability to portend outcomes. Further, these classification systems fail to consider additional factors that have been shown to influence recovery, particularly radial head enlargement along with the location[14] and size of the lesion.[5,25]

Despite the growing literature on the topic of OCD,[15,32] MRI features that are clinically meaningful for capitellar OCDs remain largely unknown. Developing a consensus on the features of a capitellar OCD that are meaningful and clinically important to physicians when developing their care plan is the first step in creating a shared lexicon and a clinically useful MRI classification system. Therefore, this study aimed to conduct a survey on the MRI features of a capitellar OCD that are salient for clinical decision-making using a classic Delphi protocol.

METHODS

The classic 3-round Delphi method was utilized to gather responses from a diverse group of clinical OCD experts to develop consensus on the features of elbow MRIs that aid in the diagnosis of capitellar OCD. Clinicians were considered OCD experts if they were (1) a board-certified orthopaedic surgeon or pediatric musculoskeletal radiologist; (2) had clinical expertise in treating capitellar OCD—defined as treating ≥5 patients annually or evaluating capitellar OCD defined as reading ≥5 imaging studies annually; and (3) fulfillment of at least 1 of the following criteria: author of ≥3 publications on capitellar OCD; member of a clinical or research interest group on OCD or lesion/defect of articular cartilage or subchondral bone within a recognized medical society; or had advance training and/or certification in pediatric and/or musculoskeletal MRI.

A steering committee was assembled to ensure quality assurance through each stage of the process and identify a list of potential experts to contact for interest in participating in this study. To provide a diverse perspective, an intentional effort was made to identify experts from different regions across the United States (New England, Middle Atlantic, South Atlantic, West South Central, East North Central, West North Central, Mountain, and Pacific) and from diverse institutions (pediatric hospitals, adult hospitals, and private practices). All identified experts were contacted by the steering committee to determine their interest in participating in this study through a Research Electronic Data Capture survey sent via email. Experts who agreed to participate and met the inclusion criteria were enrolled in this study, which was approved by the institutional review board of the primary institution.

The Delphi method is based on the idea that opinions from a group of experts are more accurate than isolated expert opinions. In the Delphi method, experts answer questionnaires in ≥2 rounds, and after each round, the organizer provides an anonymous review and compilation of the opinions provided by the experts back to them. Experts can then change their opinions or refute and support their original decisions. The process ends after several rounds (3 in this study), which is predetermined. The final results are then distributed to the experts for approval before dissemination. The Delphi process, which we followed, is shown in Figure 1.

Round 1

All study activities occurred via a secure web application that allows the building and managing of online surveys and databases known as Research Electronic Data

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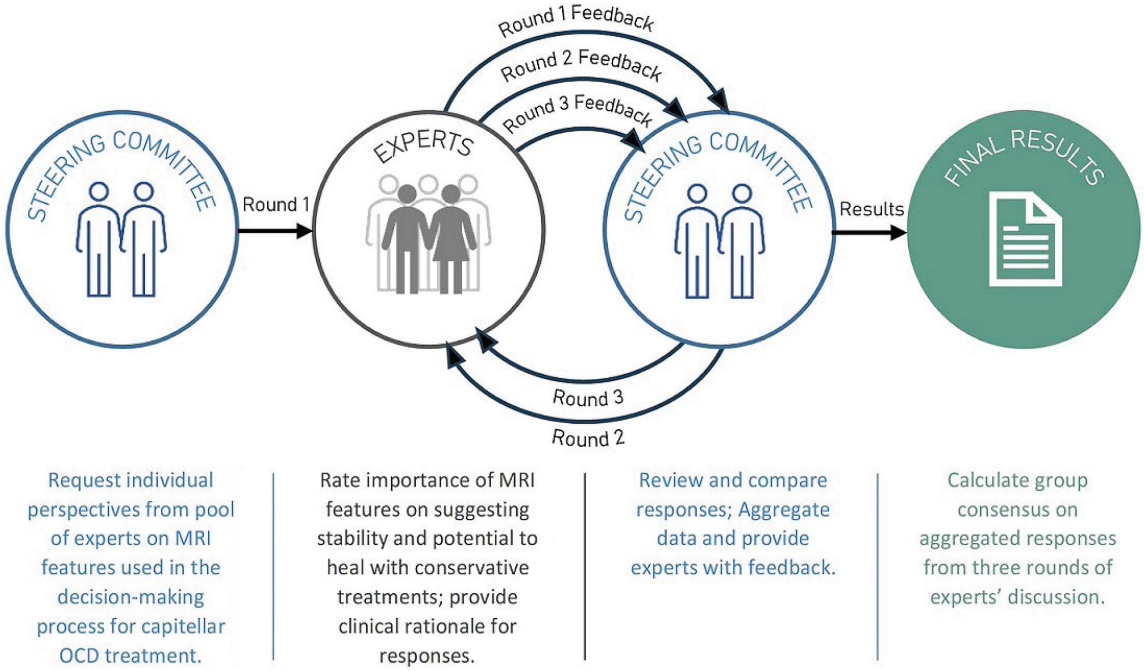

Figure 1. The Delphi process followed in this study. MRI, magnetic resonance imaging; OCD, osteochondritis dissecans.

Capture. For the first round of surveys, participants were presented with a list of common MRI features of a capitellar OCD lesion. The steering committee decided on these features after reviewing the MRI reports written by orthopaedic surgeons in their review of capitellar OCDs. Using a 5-point Likert scale (1 = *definitely important*, 2 = *important*, 3 = *undecided*, 4 = *not important*, and 5 = *definitely not important*), experts rated how important each feature was during their MRI review. In addition, participants had the opportunity to propose a characteristic or feature they felt was missing from the list. Participants were then asked questions to capture quantitative and qualitative data related to the clinical decision process. These included (1) MRI sequence reviewed, (2) MRI findings that suggest a lesion is stable, (3) MRI findings that suggest a lesion may have the potential to heal with nonoperative treatment, (4) MRI findings that suggest a lesion is unstable, and (5) MRI findings that suggest a lesion may not heal with nonoperative treatment.

Round 2

For the second round of surveys, experts were provided with aggregated results from round 1. Categorical responses for each attribute were reported as frequencies and percentages. Among the features that did not reach agreement, experts were asked whether the finding was an important characteristic that contributed to the decision for clinical care (*yes*, *no*, or *undecided*) and allowed to provide free-text responses for further clarification. Responses to open-ended questions regarding the clinical decision process were coded and summarized as themes. To prioritize these themes, experts were asked to identify 2 to 3 MRI findings most important when considering the stability of a capitellar OCD lesion, determining its potential to heal with nonoperative treatment, and evaluating an MRI of a capitellar OCD in general. Last, among the features that reached group agreement, experts were asked to identify the MRI sequences they prefer when reviewing each attribute.

Round 3

Results from experts in rounds 1 and 2 were aggregated and shared for the third round of surveys. MRI features and MRI sequences that reached group agreement were reported as frequencies and percentages for the final review. The distribution of importance and supporting commentary from experts were provided for those features that did not reach the threshold for group agreement. An aggregated list of the top 2 to 3 MRI findings that contributed to the expert's clinical decision-making were compiled. Experts were asked whether they agreed with each of these findings to determine group consensus on a final list of the top 5 most important MRI findings. Experts who did not agree with any finding in the given list were provided with the opportunity to reply via free text on how they would revise the list.

Quantitative data were analyzed using descriptive statistics. Qualitative data were analyzed and coded using thematic content based on the methodology presented by Sekayi and Kennedy.[31] The results of the open-ended questions presented in round 1 were labeled using inductive, open coding to describe themes. Once each response was

TABLE 1
Descriptive Characteristics of Participating Experts (N = 17)

Variable	n	%
Sex, male	14	82.4
Race		
Asian	3	17.6
White/Non-Hispanic or Latino	13	76.5
White/Hispanic or Latino	1	5.9
Years in practice		
5-9	3	17.6
10-14	4	23.5
15-20	5	29.4
≥21	5	29.4
Location in the United States		
New England	3	17.6
Middle Atlantic	2	11.8
South Atlantic	1	5.9
West South Central	2	11.8
East North Central	3	17.6
West North Central	1	5.9
Mountain	1	5.9
Pacific	4	23.5
Practice setting		
Pediatric hospital	14	82.4
Adult hospital	2	11.8
Private practice	1	5.9
Orthopaedic subspecialty		
Sports medicine	13	76.5
Hand, wrist, elbow	3	17.6
Other	1	5.9

labeled, statements were analyzed using axial coding. This allowed for the development of categories. Group agreement was defined a priori as >66% on acceptance of importance, and consensus was defined as >66% of group agreement on results.[33] Based on the criteria set forth by Okoli and Pawlowski,[26] a target sample size of 10 to 18 experts[27] who completed all 3 rounds was needed to reach consensus.

RESULTS

Description of Experts

Invitations to participate were sent to 33 identified experts, with 20 experts responding to the email and consenting to participate in this study. Data provided by the 17 experts who completed all 3 Delphi survey rounds are included in these results. Table 1 provides the descriptive characteristics of the experts.

Agreement and Disagreement of Features and Characteristics

A total of 33 MRI features were rated by experts on the level of importance when reviewing imaging on capitellar OCD, 30 features were initially provided to experts to rate, and 3 features were proposed by experts. Seventeen features were deemed important or definitely important (Table 2), and 16 features did not reach agreement. The distribution of responses for the MRI features that did not reach an agreement with supporting comments from experts on the rationale of their decision can be found in the supplemental table.

TABLE 2
MRI Features of Capitellar Osteochondritis Dissecans Rated as *Important* or *Definitely Important* and Reached Expert Agreement

Features Rated as Important or Definitely Important	Agreement, %
Shouldered/unshouldered lesion	100
Contained/uncontained lesion	100
Cyst-like structure in capitellum	100
Presence of loose bodies	100
High-intensity signal between progeny and native bone	88
Sagittal view: lesion depth	88
Sagittal view: lesion width	88
Coronal view: lesion width	88
Coronal view: lesion location	82
Cartilage fissures	82
Cartilage contour	76
The presence of a joint effusion	76
Radial head edema	76
Coronal view: lesion depth	71
Cyst-like structure in radial head	71
Sagittal view: lesion location	71
Physeal patency of the capitellum	71

Consensus of Clinical Decision-Making

When asked to agree on the list of salient features used during clinical decision-making from the results of rounds 1 and 2, complete consensus was achieved for the 4 features that suggest a stable capitellar OCD lesion (100%) (Table 3) and the 5 features that indicate an unstable capitellar OCD lesion (100%). The remaining 3 clinical questions reached a consensus without complete group support (Table 3). Experts who disagreed were not opposed to the aggregated list but felt further features needed to be considered. Their comments are listed below:

- Most important features—expert suggestion for revision: "*Adding contour abnormality, location on sagittal view, and demoting (downgrading) cyst in capitellum and containment*."
- Features that suggest a capitellar OCD lesion has the potential to heal with nonoperative treatment—expert suggestion for revision: *"Qualifying 'no high signal,' as 'diffuse signal,' or 'poorly demarcated increased signal,' as the demarcation of signal may decreases the chance of spontaneous healing."*
- Features that suggest a capitellar OCD lesion has a low potential to heal with nonoperative

TABLE 3
Expert Consensus on Salient MRI Features[a]

Clinical Decision	Consensus, %
Most important features	94
1. Containment of lesions	
2. Presence or absence of fluid between progeny and native bone	
3. Cartilage fissure	
4. Width and depth of lesion on sagittal view	
5. Cyst in capitellum	
Suggestive of stable OCD lesion	100
1. No articular cartilage disruption	
2. No distinct fluid behind the OCD lesion	
3. Subchondral bone continuity	
4. No displacement of progeny bone	
Potential to heal with nonoperative treatment	94
1. Articular cartilage appears intact	
2. Small, contained OCD lesion	
3. No displacement of progeny bone	
4. Open regional physis	
5. No high signal	
6. Absence of cysts	
Suggestive of unstable OCD Lesion	100
1. Cartilage disruption	
2. Subchondral bone disruption	
3. Displaced progeny bone	
4. High signal fluid beneath the cartilage	
5. Loose bodies	
Low potential to heal with nonoperative treatment	88
1. Cartilage disruption	
2. Fluid/increased signal behind lesion	
3. Well-defined OCD with discrete margins	
4. Large or multiple cysts	
5. Displaced progeny	
6. Loose bodies	

[a]Consensus used for the clinical decision-making of capitellar OCD. MRI, magnetic resonance imaging; OCD, osteochondritis dissecans.

treatment—expert suggestion for revision: *"Including 'closed regional physis,' and adding 'contour abnormality.'"*

MRI Sequences

When asked what MRI sequences experts review during their evaluation of a capitellar OCD, 100% reported utilizing fluid-sensitive (T2-weighed, short tau inversion recovery, proton density [PD]-weighted fat saturated) and 94.1% using non–fat saturated (T1-weighted, PD-weighted) sequences. Over half (64.7%) acknowledged they did not routinely have Fast Double Echo sequences available to review. Group agreement was found for the use of non–fat saturated sequences to visualize lesion location (70.6%) and width (70.6%); and the use of fluid-sensitive sequences to visualize lesion size (76.5%), location (88.2%), depth (70.6%), width (70.6%), cartilage contour (76.5%), presence of chondral fissures (70.6%), loose bodies (82.4%), presence of fluid between or behind progeny and native bone (88.2%), joint effusion (88.2%), presence of cysts (82.4%), cyst-like structures in the radial head (70.6%), and radial head edema (82.4%).

DISCUSSION

This study aimed to gather consensus among a group of orthopaedic specialists (J.A., D.Bae, D.Bohn, C.C., A.C., E.E., P.F., T.G., K.L., J.L.P., D.P., A.P., P.S., K.S., E.W., P.W., B.C., J.T.B.L., J.D.P., M.S., C.U., C.W.N.) with expertise in capitellar OCD lesions to help define a set of MRI features that have helped guide their clinical care. There were 17 MRI characteristics that our expert panel agreed on as important during the clinical decision-making process, with lesion containment, presence or absence of high signal intensity or fluid between the progeny and parent bone, cartilage fissures, lesion size on the sagittal view, and the presence of cysts or cyst-like lesions in the capitellum as key characteristics. Results from our study extend the clinical conversation on the decision-making process by identifying a salient list of MRI characteristics that aid an orthopaedic surgeon in evaluating a patient with a capitellar OCD.

MRI is an imaging modality regularly used during the early evaluation to determine the stability of a capitellar OCD. Our expert panel unanimously agreed that cartilage and subchondral bone disruption, displaced progeny bone, high signal beneath the cartilage, and intra-articular loose bodies were MRI characteristics that suggested a lesion is more likely to be unstable. These findings align with previous MRI studies assessing the stability of a capitellar OCD lesion. According to Satake et al,[30] articular irregularities and high signal intensity interfaces had a 93% and 92% predictive value, respectively, to identify unstable lesions when assessed preoperatively. Kohyama et al[13] reported high positive and negative predictive values for lesion instability when evaluating changes in articular cartilage intensity, the shape of the capitellum, and discontinuity or displacement of articular cartilage. The shape of the capitellum, spotted areas of higher intensity, discontinuity and noncircularity of the capitellar chondral surface signal, the high-intensity line separating the lesion and cartilage, and the lesion displacement or defect were the MRI characteristics evaluated by Itsubo et al[7] to determine lesion stability. However, these 3 studies assessed a predominantly male cohort of patients and may be generalizable only to young, athletic men. When evaluating a coed pediatric cohort, Nguyen et al[21] found the presence of intra-articular loose bodies, cartilage findings, subchondral disruptions, and a fluid signal intensity rim to be associated with unstable OCD lesions. While there are many similarities between the findings of the present study and previous research, the present study provides an in-depth understanding of the MRI features that do and do not demonstrate lesion stability across a larger set of criteria, The MRI features that did not reach agreement or consensus presents opportunities for future research exploring the importance of these features given the conflicting opinions by experts.

OCD of the capitellum, similar to the knee and talar dome, commonly affects children and adolescents.[11,10,11]

Identifying OCD lesions that can heal spontaneously or with nonoperative treatment is an important clinical question needed to ensure the best possible outcome for this young group of patients. Small, contained lesions, with articular cartilage that appears intact, no displacement of the progeny bone, and no presence of high signal or cyst-like lesions, all in the presence of an open regional physis, were MRI features that our group of experts reached consensus for lesions that may respond favorability to nonoperative treatment. Individually, these MRI features have been assessed for their predictive qualities in nonoperative success. Niu et al[26] found that the normalized surface area of the lesion and the presence of cyst-like lesions were predictive factors for nonoperative healing potential. Interestingly, lesion containment was not a predictor; nonetheless, this may explain the difficulties with reliably measuring or identifying containment on MRI. Using the grading systems of Itsubo et al[7] and Dipaola et al,[4] Funakoshi et al[5] found that MRI was not predictive in identifying lesions that healed spontaneously. The differences in the literature in determining whether a lesion will heal with nonoperative measures demonstrate the need for further study. In particular, outcome studies utilizing proposed specific criteria using a standard lexicon are needed to clarify this question further.

This study also explored the specific MRI sequences utilized by orthopaedic surgeons during their evaluation of a capitellar OCD. While not universally agreed upon, most orthopaedic surgeons utilized non–fat saturated sequences for geographic qualities and fluid-sensitive sequences for chondral and subchondral evaluation.[8,22] Some experts felt that additional sequences were beneficial as part of their review and endorsed the use of gradient echo, often referred to as GRE. However, many experts did not routinely review these sequences or have them available for their MRI assessment. Further review of these MRI sequences will be important to explore their role in the visualization of the lesion, severity of the disease, and use as an imaging modality to assess healing.

There are 5 MRI grading systems for OCD lesions, 2 of which are specific to the capitellum[7,13] and 3 of which are specific to the knee and talus.[4,6,20] Of the grading systems specific to the capitellum, the primary focus is to determine stability based on 3 criteria: the shape of the capitellum; continuity of the cartilage surface; and signal intensity of the cartilage, subchondral bone, and interface. The present study confirms that these grading systems rely on MRI features in determining lesion stability but seemingly do not tell the whole story or specify a common shared lexicon used for lesion reporting. This study demonstrated that other characteristics were important in evaluating these lesions and establishing reliable treatment protocols. This will be possible with 2 successive steps. The first would be to perform a reliability study on the important characteristics found in this study. Once confirmed that the characteristics can be reliably identified, an outcome study can be planned and performed to accurately identify predictive factors.

Limitations

The results of this study should be considered within the limitations and strengths of the methodology. The strength of a Delphi study is grounded in the experts recruited to participate in the study. The steering committee successfully recruited a diverse group of experts based on geographical location within the United States, years in practice, practice setting, and subspecialty. However, the experts were exclusively orthopaedic surgeons. This study could not recruit capitellar OCD experts outside of the United States and, therefore, does not include the perspective of our Japanese and European colleagues who have contributed significantly to the body of the literature published on capitellar OCD. The limited diversity of the experts may introduce a bias and make the findings of this study less generalizable. Efforts to extend this study to the underrepresented groups would be beneficial.

In addition, although the steering committee identified and invited pediatric musculoskeletal-trained radiologists to participate in this study, we were unable to recruit any experts within the timeframe of the present study. Having the expertise of pediatric musculoskeletal radiologists to augment the expertise of orthopaedic surgeons would have provided a comprehensive perspective, given the synergistic relationship between the 2 specialties in reviewing and interpreting elbow MRIs. These findings offer credible expert-level evidence that reflects the perception of orthopaedic surgeons. Defining a set of lexicons that may be used across different medical specialties that contribute to the care of these patients is needed to ensure consistency and avoid misunderstanding. For example, clarifying cyst-like lesions as perilesional or subchondral, and loose bodies as intra-articular bodies may facilitate clear communication between orthopaedic surgeons and pediatric musculoskeletal radiologists. Future work should assess the features identified as clinically important for their ability to be reliably measured among health care providers and their relationship with clinical outcomes. There is significant variability in the slice thickness of images based on sequence protocols, which may lead to underreporting of instability. Future exploration of slice thickness is warranted as it was not included in this study.

Finally, given the rarity of capitellar OCD lesions, it will be important to leverage the benefits of large, multicenter databases with prospectively collected outcomes data on lesion healing and a patient's ability to return to their desired activity.

CONCLUSION

MRI is the preferred noninvasive imaging modality used in treatment decision-making for capitellar OCD lesions. This 3-round Delphi process produced consensus on clinically relevant MRI features that contribute to clinical decision-making for capitellar OCDs. The results of this study will be used as the basis for an interrater reliability MRI assessment of the identified salient features, creating the foundation for developing a reliable MRI assessment tool

rooted in clinical experiences. Developing a standardized assessment of capitellar OCD is intended to improve clinical practice and patient outcomes.

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APPENDIX TABLE A1
MRI Features of Capitellar OCD That Did Not Reach Agreement, With Supporting Comments From Experts[a]

Radial head sclerosis
Important, 4 (24%) • "Not predictive of operative treatment but may influence the prognosis for ROM/arthrosis." • "Might push me toward surgical treatment or toward osteochondral grafting." Not important, 9 (53%) • "This is a later stage finding where the decisions for treatment are already based on the capitellum and OCD characteristics." • "It is an indicator of duration of pathology and the likelihood for poorer prognosis, but it does not affect my management directly." • "I feel this is a poor prognosticator, but it does not impact my treatment recommendations." • "Likely a late sequela of an unstable OCD rather than predictive" • "It probably more affects prognosis than the decision to treat or not." Undecided, 24% (4) • "I haven't looked for, or noticed that in the past."
Progeny
Important, 9 (53%) • "The characteristics of the progeny bone help me decide the progression of healing of an OCD. Typically, seeing the evolution of this helps me decide if the OCD is healing or not and if I should change course." • "Visible progeny bone suggests to me that the lesion may heal with fixation." • "Visibility of progeny piece of displaced portends need for surgical intervention." • "If the progeny is clearly loose and free, then go to surgery every time." • "Should be more able to heal with a primary repair so long as overlying cartilage is healthy." Not important, 7 (41%) • "Unossified cartilage can ossify if placed in the right environment." Undecided, 1 (6%) • "Many patients have no progeny bone, so cannot make any determination."
Marrow Edema
Important, 10 (59%) • "The quality and quantity of edema is important. Depending on the timing that the MRI was obtained in relation to the start of nonoperative treatment, this can help tell me if these lesions are progressing or healing." • "Suggests more acute something happening at the lesion, just not sure what it is." • "In my opinion, diffuse edema is a better prognosticator for healing with nonoperative management than demarcated edema." • "Increased signal (marrow edema) likely indicates an active process." • "It shows that the lesion is likely symptomatic, so perhaps more likely to operate on an early stage lesion with persistent marrow edema." Not important, 7 (41%) • "Marrow edema can be from too much pressure but may be a healing response." Undecided, 0 (0%) —
Fluid brilliance between progeny and native bone
Important, 10 (59) • "Can be difficult to assess, but sometimes I do see an effusion with fluid behind the OCD not being as bright; therefore, this may mean no continuity." • "High signal at the interface can indicate dissecting fluid indicating cartilage breach." • "Indicates instability to me." • "Increased signal between progeny and native bone likely indicative of increased inflammation vs fluid." Not important, 6 (35%) • "Plenty of unstable defects don't have high signal fluid undercutting the progeny." Undecided, 1 (6%) —

(continued)

APPENDIX TABLE A1
(continued)

Radial head blunting
Important, 1 (6%) — Not important, 8 (50%) • "Probably affects prognosis more than the decision to treat." • "I don't know what this is." Undecided, 7 (44%) • "To me, this is a late-stage OCD, and I still would base my decisions on the capitellum characteristics more." • "Blunting is a sign that the radial head is abnormally articulating with the capitellum; this might lean toward surgical or more "aggressive" surgical treatment but is not the only determining factor." • "Seems to be present in the majority of patients, maybe growth response to OCD lesion."
Width of the distal humerus
Important, 9 (53%) — Not important, 6 (35%) — Undecided, 2 (12%) • "Would need to look at a number of non-OCD x-rays to evaluate."
Cartilage thickness
Important, 6 (35%) • "I presume that this is relative to the juxtaposed and adjacent normal cartilage surface." • "Indicative somewhat of growth remaining/stability of lesion." • "Thinned cartilage suggests that a full-on resurfacing will be needed." Not important, 8 (53%) • "Thickness is not as important as the quality of the cartilage." • "In my opinion, increased cartilage thickness over the lesion compared to the adjacent bone is a poor prognosticator for lesion stability." • "Cartilage thickness is more related to the age of the patient." Undecided, 2 (12%) —
OCD lesion to capitellum ratio (sagittal view)
Important, 9 (53%) • "Small lesions can do better with less cartilage restoration, and larger lesions have a higher chance of engagement." • "Bigger is worse." • "For very LARGE lesions, difficult to treat with a single plug osteochondral graft." Not important, 7 (41%) • "Would reflect the size of the lesion; unclear if the size is a determinant in clinical outcome." • "I just go by size, especially when doing OATs, to know the size to transfer." Undecided, 6% (1) —
Radial head width to capitellum ratio
Important, 3 (18%) • "Smaller lesions can do better with less, and larger lesions may need more structural resurfacing." Not important, 10 (59%) • "An indicator of poorer outcomes, but not necessarily something that changes my management." Undecided, 4 (24%) —

(continued)

APPENDIX TABLE A1
(continued)

Physeal patency of the radial head
Important, 5 (29%) • "It is one indication of skeletal maturity, but it is not the only measure." Not important, 10 (59%) • "Other than indicating the age of patient/skeletal immaturity." Undecided, 2 (12%) • "Can be a sign of immaturity, but capitellum physis is more important."
OCD lesion width to the width of the distal humerus ratio (coronal view)
Important, 3 (19%) — Not important, 8 (50%) • "Location is more important and related to the radial head. Wider or narrower distal humerus would not change my management." Undecided, 16 (31%) • "May relate to containment, but not enough information."

[a]The number and percentage of experts is given after each rating. Dashes indicate that no comments were provided. OAT, osteochondral autograft transplantation; OCD, osteochondritis dissecans; MRI, magnetic resonance imaging; ROM, range of motion.