

Peer Review File

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Review Comments (the First Round)

Reviewer A

The article provides a very in-depth review of glenoid bone loss, its various classifications, as well as management options and highlights the limited available literature for treatment option comparisons. The authors' knowledge and background of the topic is noted. This article provides a comprehensive review and does a good job synthesizing relevant articles and the progression of the topic of glenoid bone loss diagnosis, classification and management. Below are some recommendations that were noted throughout review.

Comment 1: Consider defining the type of review article- Narrative vs. systematic review etc. for formatting purposes.

Reply 1: The review article has been defined as narrative review

Changes in text: Glenoid Bone Loss in Shoulder Arthroplasty: **A Narrative Review**

Comment 2: In-text citation numbering begins in the abstract and not the introduction/ main-body portion of document, this may need adjusted.

Reply 2: The sentence with its citations has been added to the introduction.

Changes in text: Lines 76-81: Since the development of the modern reverse total shoulder replacement, there has been an exponential increase in its utilization, with expanding indications including the management of severe rotator cuff arthropathy, massive rotator cuff tears with pseudo paralysis, arthritis, and proximal humeral fractures.

On the other hand, anatomic total shoulder arthroplasty (TSA) remains the preferred surgical option for addressing primary osteoarthritis of the glenohumeral joint with intact cuff that results in pain and disability

Comment 3: Lines 82-83 may benefit from a citation.

Reply 3: This has been added.

Changes in text: Citation added Line 88

Comment 4: Line 85: Could change "inn" to "in"

Reply 4: This has been added.

Changes in text: Line 90: in

Comment 5: Section 3.1, lines 118-120, could be expanded upon in terms of how the statement relates, in detail, to the discussion to follow.

Reply 5: This has been added.

Changes in text: Lines 144-147 For instance, patients with CTA generally present with superior glenoid bone erosion, along with posterior erosion for those with primary arthritis, and anterior erosion for those with chronic shoulder instability. In addition, inflammatory arthritis tends to have central erosion. Revision shoulder arthroplasty has no specific GBL pattern

Comment 6: Section 3.1.2 may benefit from explaining why these changes are occurring as compared to primary OA

Reply 6: Further elaboration has been added.

Changes in text:

Lines 160-164: This is primarily attributed to the mechanical forces and imbalances created by the chronic rotator cuff tears, which in turn fail to provide adequate support to the humeral head. As a result, the humeral head may migrate superiorly, creating abnormal contact and impingement between the humeral head and the acromion and eventually leading to erosion of the superior aspect of the humeral head.

Comment 7: Lines 301-326 may include more references

Reply 7: It has been added.

Changes in text: References Added to line 376 and line 386

Comment 8: Lines 325-326 may benefit from a citation

Reply 8: Citation has been added.

Changes in text: Citation Added to Line 393

Comment 9: Section 3.4 may benefit from citations for the first paragraph. Section 3.5 as well.

Reply 9: Citation has been added.

Changes in text: Section 3.4: Citation added to line 327; Section 3.5: Citation added to line 362

Comment 10: Many of the paragraphs have all sources relating to the paragraph listed at the end of the paragraph. It may be beneficial to place a citation after individual sentences in certain areas when complex topics are explained or statistical values are reported. Also, citations may be needed after "author's name et al." is used in individual sentences. Line 333 etc. There are several examples of this.

Reply 10: Citations added.

Changes in text: Citations added throughout the text.

Reviewer B

Comment 11: The authors compiled a worthy manuscript but the methodology needs to be revised. A systematic review and a concept review are different types of studies. A systematic review has a specific question that is addressed via a systematic search and selection criteria. Some of these projects may provide qualitative findings due to data heterogeneity from the included studies. Most will have quantitative findings which answer the posed clinical question. Systematic reviews have specific inclusion and exclusion criteria and data collection which is intended to answer the posed clinical question. The authors provide a very broad objective for which a systematic review methodology is inappropriate. The authors have written a concept review of shoulder arthroplasty with existing glenoid bone loss.

Reply 11: It has been changed to narrative review.

Changes in text: Glenoid Bone Loss in Shoulder Arthroplasty: a Narrative Review

Reviewer C

Dear authors,

The paper is well-written and nicely summarizes the topic. I would add some

references, though:

Comment 12: L 125-131 and all through the text: I Would use the term axial plane and coronal plane instead of vertical and horizontal - easier to picture in one's mind.

Reply 12: It has been corrected.

Changes in text: Lines 152, 159, 160, 199, 200, 215, 232, 248 - Changed to axial and coronal

Comment 13: L138: move L 296-299 here

Reply 13: It has been corrected.

Changes in text:

Lines 172-175: Generally, when managing any glenoid defect, the goal is to restore appropriate glenoid line and the glenoid bone stock. It is also important to re-establish the scapular neck length and lateralize the glenoid when significant medial erosion is present to avoid inferior glenoid notching and optimize the tensioning and lever arms of the deltoid muscle as well as the resting length of the residual rotator cuff.

Comment 14: L 158: Please use the modified Walch classification by Bercik et al JBJS 2016

you can mention that A subtype is inflammatory/OA; B is OA, C is dysplasia and D: chronic anterior instability.

Reply 14: It has been corrected.

Changes in text:

L 201-209: This classification divided the pathology into three main categories, modified to four categories by Bercik et al., with their subtypes: Type A: inflammatory osteoarthritis (further divided into A1 and A2), Type B: primary osteoarthritis (further divided into B1 and B2), Type C: dysplasia, and Type D: chronic anterior instability.

Comment 15: L 185 this is actually Sirveaux Favard: JBJS 2004

Reply 15: It has been corrected.

Changes in text: L 233 Sirveaux Favard

Comment 16: L 290: Please add Navigation technology: Holzgrefe JSES 2023

Reply 16: it has been corrected with 4 references including the one requested

Changes in text: Line 342-359

Computer Navigated Instrumentation:

The recent advancement of computer-navigated instrumentation has greatly improved intraoperative execution in the management of GBL. Navigation systems provide real-time visual feedback to guide the surgeon's instrument positioning, ensuring precise alignment with the preoperative plan. This is achieved using a line-of-sight camera and trackers attached to both the surgical instruments and the scapula.

Compared to patient-specific guides, which require custom manufacturing and may have a waiting period, navigation systems are readily available immediately after preoperative planning. They offer the advantage of flexibility, allowing for intraoperative alterations to the surgical plan based on the surgeon's discretion, if unexpected factors are encountered.

One specific application of computer navigation in GBL is the navigation of glenoid baseplate variable angle compression screws. This technology enables visualization of a customized trajectory into the glenoid vault, facilitating the optimization of screw length and purchase. By maximizing these parameters, the stability and longevity of the implant can be enhanced.

While numerous studies have validated the improved accuracy and precision of glenoid baseplate implantation using navigation in RSA, the clinical benefits in terms of improved outcomes, reduced complications associated with glenoid malpositioning, and long-term implant survival remain uncertain. Therefore, further research is needed to establish the clinical advantages of navigation systems in the management of glenoid bone loss [37]-[40]

Comment 17: L 296-299: move that section to L138 and just write - restoration of the joint line.

Reply 17: It has been corrected.

Changes in text: Added to line 172

Comment 18: L 302- mild Glenoid GBL and version.

Reply 18: It has been corrected.

Changes in text: Added to line 368

Comment 19: L 353 - mentions that augments are used for anatomic arthroplasty as well.

Reply 19: It has been corrected.

Changes in text: L 436-437 It's worth mentioning that bone grafting and augmented baseplate have also been utilized in anatomic TSA

Reviewer D

Thanks for submitting your manuscript on Glenoid bone loss. I read this with interest and would recommend for publication with some additions/ changes.

Comment 20: As use of navigation, virtual planning (PSI Jigs) and augmented / mixed reality is becoming common in management of patients with glenoid bone loss, it would be better to add evidence on that. Some of the relevant papers are as below.

1. Schoch BS, Haupt E, Leonor T, Farmer KW, Wright TW, King JJ. Computer navigation leads to more accurate glenoid targeting during total shoulder arthroplasty compared with 3-dimensional preoperative planning alone. *J Shoulder Elbow Surg.* 2020 Nov;29(11):2257-2263. doi: 10.1016/j.jse.2020.03.014. Epub 2020 Jun 9. PMID: 32586595. (ADDED as a reference in computer navigated instrumentation)

2. Hao KA, Sutton CD, Wright TW, Schoch BS, Wright JO, Struk AM, Haupt ET, Leonor T, King JJ. Influence of glenoid wear pattern on glenoid component placement accuracy in shoulder arthroplasty. *JSES Int.* 2022 Jan 15;6(2):200-208. doi: 10.1016/j.jseint.2021.11.021. PMID: 35252914; PMCID: PMC8888204. (ADDED as a reference in computer navigated instrumentation)

3. Lohre R, Warner JJP, Athwal GS, Goel DP. The evolution of virtual reality in shoulder and elbow surgery. *JSES Int.* 2020 May 7;4(2):215-223. doi: 10.1016/j.jseint.2020.02.005. PMID: 32490405; PMCID: PMC7256885. (ADDED as a reference in computer navigated instrumentation)

4. Mohammad Daher, Joe Ghanimeh, Joeffroy Otayek, Ali Ghoul, Aren-Joe Bizdikian, Rami EL Abiad, Augmented Reality and Shoulder Replacement: A State Of The Art Review Article., *JSES Reviews, Reports, and Techniques*, 2023,ISSN 2666-6391

5. Colasanti GB, Moreschini F, Cataldi C, Mondanelli N, Giannotti S. GPS guided reverse shoulder arthroplasty. *Acta Biomed.* 2020 May 30;91(4-S):204-208. doi: 10.23750/abm.v91i4-S.9377. PMID: 32555098; PMCID: PMC7944829.
6. Verborgt O, De Smedt T, Vanhees M, Clockaerts S, Parizel PM, Van Glabbeek F. Accuracy of placement of the glenoid component in reversed shoulder arthroplasty with and without navigation. *J Shoulder Elbow Surg.* 2011 Jan;20(1):21-6. doi: 10.1016/j.jse.2010.07.014. PMID: 21134663.
7. Venne G, Rasquinha BJ, Pichora D, Ellis RE, Bicknell R. Comparing conventional and computer-assisted surgery baseplate and screw placement in reverse shoulder arthroplasty. *J Shoulder Elbow Surg.* 2015 Jul;24(7):1112-9. doi: 10.1016/j.jse.2014.10.012. Epub 2015 Jan 1. PMID: 25556807

Reply 20: it has been added

Changes in text: references 1, 2, and 3 added to line 358

Reviewer E

Comment 21: The authors should distinguish this is a descriptive review, not a systematic review, and as such the methodology of finding relevant articles is not required (table 1 can be removed as well). I have a few more to add.

Reply 21: Specified that it's a narrative review.

Changes in text: table 1 removed

Comment 22: Line 364: should be "systematic".

Reply 22: It has been corrected.

Changes in text: systematic, line 430

Comment 23: Line 374: should be "resulted".

Reply 23: It has been corrected.

Changes in text: Resulted, line 442

Comment 24: Line 388: need a transition sentence or subheader to differentiate this paragraph from prior discussion of custom implants.

Reply 24: It has been corrected.

Changes in text: L457- 458

Review Comments (the Second Round)

Reviewer A

Comment 1: Lines 98-99: The authors made a definitive statement without a citation. If none is available, the statement needs to be softened.

Reply 1: The citation has been added.

Changes in text: Citation [7] added (line 100)

Comment 2: Lines 104-105/Lines 112-114: The authors present an objective consistent with a concept review, but the methods are consistent with a systematic review. A concept or narrative review details concepts related to a pathology, or procedure. These reviews do not require a methods nor results section. A systematic review reports qualitative or quantitative answers to a specific clinical question using systematic methods of database search and retrieval. Please determine which of these are appropriate for your article and devise an appropriate manuscript format. The terms “provide an overview”, “address the importance of”, and “provide guidance” indicate a concept or narrative review. These terms do not state specific clinical questions. Thus, no methods nor results section are appropriate.

Reply 2: We thank the reviewer for this comment. Initially we were asked to provide a methods section which was done – as such we will leave it to the editor to determine what is required for this. Certainly, it is not unreasonable to have a narrative review performed with some details regarding the methods – while it is not as rigorous as a systematic review, we do not see an issue with highlighting that we took care to search multiple databases for common keywords to inform this narrative review. We believe it can provide the reader with some degree of understanding that certain steps were taken to limit bias in the review.

Changes in text: We have changed results to “findings and discussion” to address some of these concerns.

Comment 3: Line 122: Remove “For instance”

Reply 3: The change has been implemented in the text.

Changes in text: “For instance” was removed from the beginning of the sentence.

Comment 4: Lines 130: “posterior humeral head subluxation” does not occur in “the axial plane”.

Reply 4: The proper term has been added in the text.

Changes in text: The most common being posterior humeral head subluxation, often presenting with posterior GBL

Comment 5: Lines 134-135: Please reference this statistic.

Reply 5: The citation has been added.

Changes in text: Citation [35] added (line 140)

Comment 6: Line 136: Humeral head movement in the coronal plane indicates a medial/lateral shift in position. Humeral head movement in the axial plane indicates a superior/inferior shift in position. Humeral head movement in the sagittal plane indicates an anterior/posterior shift in position. Please correct these descriptions. These are elementary concepts.

Reply 6: Thank you for catching this. The terms have been changed in the text.

Changes in text: Replaced “axial” with “sagittal” (line 138) and replaced “coronal” with “axial” (line 139)

Comment 7: Line 164: remove “help”

Reply 7: The change has been implemented in the text.

Changes in text: “Help” was removed from the sentence.

Comment 8: Line 165: remove “both”

Reply 8: The change has been implemented in the text.

Changes in text: “Both” was removed from the sentence.

Comment 9: Line 166: remove “below are various” - re-phrase the sentence

Reply 9: The sentence has been re-phrased.

Changes in text: Sentence was re-phrased as follows: Various classification systems exist based on the direction of glenoid erosion and containment status.

Comment 10: Lines 176-179: Too long for a single sentence

Reply 10: The sentence was divided into two sentences.

Changes in text: The sentences now read as follows: This classification divided the pathology into three main categories, which was later modified to four categories by Bercik et al. to include subtypes. The classification is as follows: Type A: inflammatory osteoarthritis (further divided into A1 and A2), Type B: primary osteoarthritis (further divided into B1 and B2), Type C: dysplasia, and Type D: chronic anterior instability [36].

Comment 11: Lines 181-182: medialization is not in the axial plane

Reply 11: The proper term has been added in the text.

Changes in text: Replaced “axial” with “coronal”

Comment 12: Lines 214: cuff tear arthropathy does not need to be capitalized

Reply 12: The change has been implemented in the text.

Changes in text: “Cuff Tear Arthropathy” changed to “cuff tear arthropathy”

Comment 13: Lines 219-220: Nothing else re: Hamada?

Reply 13: This paragraph briefly introduces several classification systems for CTA and provides a reference for further reading if the author is inclined to do so for this widely utilized classification.

Changes in text: N/A

Comment 14: Lines 420-421: Why is the current body of evidence limited? You reviewed quite a number of studies in the prior sections.

Reply 14: This sentence isn't meant to convey the message that the current body of evidence is limited, but rather that there are limitations to the current body of research, ie. low methodological quality and a lack of comparative studies.

Changes in text: N/A

Comment 15: Lines 434-436: This is a good summation.

Reply 15: Thank you for your comment.

Changes in text: N/A

Comment 16: Conclusion: The authors have 3 paragraphs under the conclusion. This is inappropriate. These limitations are consistent with systematic reviews where a specific clinical question is answered following collection of data from a systematic search and retrieval criteria.

Reply 16: Thank you for this comment. The conclusion section has been reworked accordingly.

Changes in text: Conclusion has been shortened to one paragraph – lines 665-673

Comment 17: Figures: The figures are acceptable but additional visuals of the classifications would be beneficial.

Reply 17: While this may certainly be helpful it is difficult to provide this due to copyright issues with published images of classification systems.

Changes in text: N/A

Reviewer B

The authors have improved the manuscript and addressed the recommendations provided on previous review.

Comment 18: - Line 81: "in cases of cases" can be fine tuned.

Reply 18: The change has been implemented in the text.

Changes in text: Duplicate “cases of” was removed from the sentence.

Comment 19: - Line 206: 2 periods used.

Reply 19: The change has been implemented in the text.

Changes in text: The period following “appropriately” was removed.

Comment 20: - Line 336: source 19 follows period

Reply 20: The change has been implemented in the text.

Changes in text: The period was moved to after source 19.

Comment 21: - Line 354: "threw" can be changed to "through"

Reply 21: The change has been implemented in the text.

Changes in text: Replaced “threw” with “through”