

Point-by-point responses to the recommendations and comments of the reviewers:

Thanks for your clear and valuable advice and for giving us the opportunity to revise this manuscript. We think that we were able to follow the recommendations of the reviewers. We appreciate the time invested and comments provided by each reviewer. The manuscript has certainly benefited from these suggestions.

Reviewers' comments:

Reviewer #1, ID 02706155

I appreciate your job on this research, which should be considered valuable for clinical practice.

We are glad that the reviewer judges that our research is of practical interest and that he supports the publication of the manuscript.

Reviewer #2, ID 02566697

this a case series report of stemless shoulder arthroplasties. the number of patients is small (only 19 available for follow-up, only 17 available for rx evaluation). the follow up time is small (less than 2 years)...

Regarding the short mean follow-up and the small number of shoulders being evaluated, we completely agree with the reviewer. This is a major limitation. A larger long-term study is needed. Therefore, we recently submitted an application for ethical approval of such a future research study. This important aspect has been included in the discussion as recommended.

...the outcomes are poor: from 23 cases: two rotator cuff tears, one revision to stemmed, one brachial plexus palsy, one frozen shoulder.(reintervention rate of 14% at less than two years follow-up, 4/23)...

The outcome in regard to the complication rates is important and the criticism of the reviewer is certainly correct. Expectations on anatomic shoulder replacements are high and therefore this point has to be discussed and highlighted.

In this study we had to document 3 complications. 3 of 21 means a 14% overall complication rate. A very recent meta-analysis on 19262 total shoulder arthroplasties revealed an overall complication rate of 11% (2122 complications) at a mean follow-up of 40.3 months [Bohsali JBJS Am 2017]. Another review from 2017 shows overall

complication rates between 4.2 and 15.2% [Roberson J Shoulder Elbow Surg. 2017]. Thus, our overall complication rate is high and lies at least in the upper range compared to the literature.

Looking closer, we had one patient with a partial brachial plexus lesion treated with an intensive rehabilitation, one frozen shoulder treated with an arthroscopic capsular release and one a cuff failure treated with a revision to a reversed prosthesis. In regard to the small number of 21 shoulders being evaluated for this study, the assessment of complication incidences should be regarded cautiously. However, each complication shows an incidence of 4.7% (1/21).

In the literature, a postoperative arthrofibrosis is only described as a rare complication. For example, an arthrofibrosis requiring an arthroscopic arthrolysis is documented in only a few studies included in two systematic review articles [Harmer et al. Curr Rev Musculoskelet Med. 2016, Roberson et al. J Shoulder Elbow Surg 2017].

Rotator cuff failures are reported with an incidence between 1.3% and 14% [Norris et al. J Shoulder Elbow Surg 2002, Bohsali et al. JBJS Am 2006, Levy Int J Shoulder Surg 2016]. An incidence of 4.7% (1/23) lies in the range of the literature. However, we agree with the reviewer's opinion that this should be discussed more critically.

Regarding the incidence of plexus lesions, incidences of up to 15% have been described in the literature [Lynch et al. J Should Elbow Surg 1996, Pape et al. Z Orthop Unfall 2010]. Even if one plexus lesion in our series lies in the range of the literature, a plexus lesion is an extremely rare complication in our clinic, which has very high numbers of shoulder replacement surgeries. Therefore, we followed the recommendation and discussed this complications more critically.

Taken together, our complication rate is high and lies in the upper range compared to the literature. In our opinion, the results regarding complications in our study are poor and interfere with the outcome scorings. We therefore discussed and criticized this point as recommended. To really highlight the importance of this new section, we placed it right at the beginning of the discussion.

...the authors show that center of rotation restoration is obtained inconsistently (14 of 17 cases, 82%) thus I think that this paper is not worthy of publication unless the authors rewrite it in the light of their poor results.

The reviewer mentioned that the restoration of the center of rotation is obtained inconsistently. Regarding the frequency of cases with an exact restoration of the center of rotation, the results presented in this study are better compared to the literature: Using different anatomical prosthesis types but the same assessment method (best-fit circle method), Alolabi et al. demonstrated much higher outlier rates lying between 31.2% and 65.1%! Also, the mean deviation between the premorbid center of rotation and the center of the prosthesis measured between 2.5 and 3.8 mm [Alolabi et al. J shoulder elbow surg 2014] which is two to four times higher compared to our study. In conclusion, a mean deviation of 1.0mm and an outlier rate of 18%, as

documented in our study, are acceptable. However, we were not able to demonstrate a 100% rate of restoration of the center of rotation. To address the requests of the reviewer, we discussed the restoration of the joint geometry much more critically.

Reviewer #3, ID 00467030

After reviewing the entire submitted manuscript, it is a well-written manuscript with information useful to the readers of the journal. There is a concern: As only 21 shoulders with a mean follow-up 18 of months were included, to my opinion, whether there is enough sample size and enough follow-up period need to be discussed.

Done. As mentioned above (see comments to reviewer ,1) the short mean follow-up and the small number of shoulders being evaluated is a limitation and has to be discussed.

Bohsali KI, Bois AJ, Wirth MA. Complications of Shoulder Arthroplasty. *J Bone Joint Surg Am* 2017; **99**: 256-269 [PMID:28145957 DOI: 10.2106/JBJS.16.00935]

Roberson TA, Bentley JC, Griscom JT, Kissenberth MJ, Tolan SJ, Hawkins RJ, Tokish JM. Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review. *J Shoulder Elbow Surg* 2017; **26**:1298-1306 [PMID: 28209327 DOI: 10.1016/j.jse.2016.12.069]

Harmer L, Throckmorton T, Sperling JW. Total shoulder arthroplasty: are the humeral components getting shorter? *Curr Rev Musculoskelet Med* 2016; **9**:17-22 [PMID: 26801933 DOI: 10.1007/s12178-016-9313-3]

Norris TR, Iannotti JP. Functional outcome after shoulder arthroplasty for primary osteoarthritis: a multicenter study. *J Shoulder Elbow Surg* 2002; **11**:130-135 [PMID: 11988723 DOI: http://dx.doi.org/10.1067/mse.2002.121146]

Bohsali KI, Wirth MA, Rockwood CA Jr. Complications of total shoulder arthroplasty. *J Bone Joint Surg Am* 2006; **88**:2279-2292 [PMID: 17015609 DOI: 10.2106/JBJS.F.00125]

Levy DM, Abrams GD, Harris JD, Bach BR Jr, Nicholson GP, Romeo AA. Rotator cuff tears after total shoulder arthroplasty in primary osteoarthritis: A systematic review. *Int J Shoulder Surg* 2016; **10**: 78-84 [PMID: 27186060 DOI: 10.4103/0973-6042.180720]

Lynch NM, Cofield RH, Silbert PL, Hermann RC. Neurologic complications after total shoulder arthroplasty. *J Should Elbow Surg* 1996; **5**:53-61 [PMID: 8919443 DOI: 10.1016/S1058-2746(96)80031-0]

Pape G, Raiss P, Aldinger PR, Loew M. [Comparison of short-term results after CUP prosthesis with cemented glenoid components and total shoulder arthroplasty: a matched-pair analysis]. *Z Orthop Unfall* 2010; **148**:674-679 [PMID: 20135592 DOI: 10.1055/s-0029-1186202]