

Is there a role for reinforcing soft tissue repairs or flaps for patients with abductor deficiency?

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Response/Recommendation:

Yes. Reinforcing soft tissue repairs, either alone or in combination with muscle flaps, should be considered in patients with abductor deficiency undergoing revision total hip arthroplasty.

Level of Evidence : Low

Rationale:

Although the number of articles published in the literature on this topic is limited, they are mostly in the form of retrospective case series and reviews. There are no randomized controlled trials or meta-analyses available on this issue.

The treatment protocol for abductor deficiency should be planned after a comprehensive history, physical examination, and radiographic evaluation. A detailed initial history should include the mechanism and timing of injury, direction of dislocation (if any), the ease or difficulty of hip reduction, previous episodes of instability, the timing of initial THA, and the details of components used.

It should be noted that abductor deficiency can develop due to component-related issues (wear, malposition), neurological causes (e.g., superior gluteal nerve), or infections, apart from soft tissue problems [1,2]. In recent years, abductor deficiency is seen with more frequency in patients with adverse local tissue reaction (ALTR) as a result of release of cobalt and chromium ions from the corrosion of trunnion of femoral stem when metal head reacts with titanium trunnion on the stem, use of metal on metal bearing surface, or possibly release of metal ions from the backside wear in a modular dual mobility construct.[3,4]

Abductor deficiency after THA can be classified as early and chronic. In patients with partial tear and detachment of abductor muscles, tenodesis of gluteus medius and gluteus minimus may be attempted. Repair is usually performed by creating tunnels in the bone and suturing the abductor mechanism to the bone using non-absorbable sutures. Primary repair may be attempted during the early period, first 15 months, following total hip arthroplasty. [5,6]

In cases of chronic abductor insufficiency (>15 months) with preserved gluteus maximus function, gluteus maximus tendon transfer +/- tensor fascia lata transfer or gluteus maximus advancement has been described.[7-14]

Dr Whiteside's initial study investigated gluteus maximus transfer for patients with abductor deficiency. In his study, 11 patients with abductor deficiency (7 female, 4 male; mean age 67 years) were included. Nine of these 11 patients required revision THA due to implant-related issues. At an average final follow-up of 33 months, 10 patients were able to abduct the hip against gravity. Among these patients, nine showed a negative Trendelenburg sign and demonstrated "strong abduction," allowing them to walk without a limp. One patient had a mild limp and weak abduction. One of the 11 patients experienced a severe limp and was lost to follow-

up at 6 months.[7] Paul Ruckstuhl provides an overview of clinical and patient-reported outcomes for 18 patients treated with a gluteus maximus flap transfer due to chronic abductor deficiency, revealing diverse results. These patients, with a mean age of 64 years (range: 53-79), were primarily operated on due to complications from total hip arthroplasty or revision arthroplasty (83%). Evaluations included pre- and postoperative pain, the Trendelenburg sign, internal rotation lag sign, trochanteric pain syndrome, the Harris Hip Score (HHS), and abduction strength according to the Janda scale (0-5). Additionally, postoperative patient satisfaction and health-related quality of life (HRQOL) were assessed using the Short Form 36 (SF-36) as patient-reported outcome measurements (PROMs). Postoperative MRI scans were performed in 13 cases (72%). Results showed a decrease in local pain from a mean NRS score of 6.1 (0-10) to 4.9 (0-8), and 44% of patients exhibited a negative Trendelenburg sign postoperatively. Although overall HHS ($p = 0.42$) and muscular abduction strength ($p = 0.32$) improved, these changes were not statistically significant. The postoperative HRQOL scores averaged 46.8 for the mental component and 37.1 for the physical component, with a significant positive correlation between the physical component and HHS scores ($R = 0.88$, $p < 0.001$). Moreover, 72% of patients expressed willingness to undergo the operative treatment again. MRI evaluations indicated no significant further loss of muscle volume or degeneration of muscular tissue.[8] In a retrospective study, Christofilopoulos et al. presented a gluteus maximus transfer technique for patients with chronic abductor tears not amenable to primary reconstruction, evaluating 38 patients surgically managed for chronic abductor insufficiency. This cohort included patients without hip implants as well as those following primary or revision total hip arthroplasty (THA). All patients exhibited a Trendelenburg gait, impaired abductor muscle strength ($\leq M4$), and significant fatty degeneration of muscles (Goutallier ≥ 3). The surgical procedure involved transferring a flap from the anterior

third of the gluteus maximus to the greater trochanter, sutured under the slightly mobilized vastus lateralis. Outcomes were assessed at 12 postoperative months, including pain levels, functional scores, muscle strength, and the presence of Trendelenburg gait. The mean age of patients was 70.2 years, with 10 patients receiving the tendon transfer on a native hip, 6 following primary THA, and 22 after revision THA. Results indicated significant improvements: mean pain level decreased from 7 to 3.2 ($p < 0.001$), Harris Hip Score increased from 41.6 to 80.2 ($p < 0.001$), and median abductor strength improved from 3 to 4 ($p < 0.001$). At the 12-month follow-up, 26 patients had a negative Trendelenburg sign, and 12 had a positive sign. No serious complications were reported. This salvage technique effectively improved abductor strength, functional outcomes, and reduced pain in 80% of patients with chronic abductor tears, demonstrating favorable short-term results; however, further evaluation is necessary for long-term outcomes.[9]

In his 2014 publication, Dr. Whiteside described a new technique where the anterior portion of the gluteus maximus and the entire tensor fasciae latae (TFL) are mobilized and transferred to the greater trochanter, aligning the muscle fiber direction of the transferred muscles closely with that of the gluteus medius and minimus. Five patients (five hips) underwent treatment for primary irreparable disruption of the hip abductor muscles using this technique. All patients presented with severe or moderate pain, a severe abductor limp, and a positive Trendelenburg sign. Patients were assessed for pain and functional outcomes at an average of 28 months following surgery (ranging from 18 to 60 months). By three months postoperatively, all patients were able to actively abduct. One year after surgery, three patients reported no hip pain, two experienced mild pain that did not restrict their activities, three had no limp, and one had a mild limp. However, one patient fell and sustained a fracture of the greater trochanter, resulting in persistent limp and weakness in abduction.[10] In subsequent years, Dr. Chandrasekaran modified the technique

described by Dr. Whiteside. They mobilized and transferred the anterior 1/3 of the gluteus maximus and the posterior 1/3 of the tensor fasciae latae (TFL) to the greater trochanter. All patients had follow-up at mean 2.1 years (1.25-2.5) with positive Trendelenburg signs preoperatively; 2 patients normalized postoperatively. For 2 patients, abductor strength improved by 2 grades postoperatively; the other patient maintained grade four. 2 patients' PROs all improved; the other patient's PROs all improved except mHHS. Postoperative VAS scores were 0, 0, 1. 2 patients reported maximum satisfaction.[11] In another study, 18 patients and 18 hips underwent combined transfer of the gluteus maximus and TFL muscles using a modified surgical technique. The mean follow-up period was 39.75 months (range, 12.04 to 93.88 months). The average age of the patients was 68.48 ± 11.05 years, with an average body mass index (BMI) of 29.54 ± 6.23 kg/m², and 13 patients were female. Abductor strength improved in 17 patients, while abduction data was unavailable for 1 patient. The study showed significant improvements in the modified Harris Hip Score, from 49.73 ± 16.85 to 74.94 ± 17.91 ($p < 0.001$), the Non-Arthritic Hip Score, from 55.02 ± 22.53 to 72.78 ± 19.17 ($p = 0.032$), and the visual analog scale for pain, from 5.42 ± 3.42 to 1.57 ± 1.68 ($p = 0.0004$). No secondary surgeries were reported during the follow-up period.[12]

Transfer of tensor fascia lata has been explored in patients with posterior capsular deficiency. The report on the initial series included 22 patients (15 female, 7 male) with an average age of 75 years, each experiencing an average of 6 dislocations following THA. After a mean follow-up period of 54 months (ranging from 6 to 154 months), 17 out of the 22 patients had a stable hip with no further instances of instability. [13] In a retrospective series, acetabular cup revision combined with TFL reconstruction for the management of massive abductor avulsion after failed THA was performed. They report on 17 patients with massive abductor avulsions after THA

treated with medialization of the acetabular component and TFL reconstruction. All patients presented with severe limp, a positive Trendelenburg sign, and avulsion of the abductor insertion confirmed on MRI. The mean age was 69 years (range, 50-83 years), and the mean follow-up period was 36 months (range, 18-78 months). Postoperatively, 9 patients (47%) had no limp, 8 patients had a mild limp, and abductor power improved from a mean of 2.5/5 to a mean of 3.8 ($P < 0.0001$). At the latest follow-up, the Harris Hip Score was excellent in 6 hips (37%), good in 7 hips (43%), and fair or poor in 3 hips (23%). Two patients with a mild limp were not satisfied with their procedure.[14]

Another option to address abductor deficiency is vastus lateralis advancement, for patients with smaller defect (<10 cm) .[15,16] In a cohort of 11 patients with abductor deficiency (5 female and 6 male; mean age of 65 years), the vastus lateralis advancement yielded favorable results.[16]

Fehm et al. described the use of an Achilles tendon allograft for abductor reconstruction in seven patients. Before the reconstruction, the patients had an average Harris Hip Score of 34.7 points and an average pain score of 11.4 points. Following a minimum follow-up duration of twenty-four months, the average Harris Hip Score increased to 85.9 points, and the average pain score improved to 38.9 points. [17]

Drexler et al. report on the clinical outcomes of reconstructing deficient abductor muscles following revision THA using a fresh-frozen allograft of the extensor mechanism of the knee. A retrospective analysis was conducted on 11 consecutive patients with a severe limp due to abductor deficiency, confirmed by MRI scans. The mean age of the patients (three men and eight women) was 66.7 years (range, 52 to 84 years), with a mean follow-up of 33 months (range, 24 to 41 months). Postoperatively, two patients had no limp, seven had a mild limp, and two had a persistent

severe limp ($p = 0.004$). The mean power of the abductors improved on the Medical Research Council scale from 2.15 to 3.8 ($p < 0.001$). Preoperatively, all patients required a stick or walking frame; postoperatively, four patients were able to walk without an aid. Overall, nine patients had severe or moderate pain preoperatively, whereas ten patients had no or mild pain postoperatively. At the final review, the Harris hip score was good in five patients, fair in two patients, and poor in four patients. The study concludes that using an extensor mechanism allograft is relatively effective in treating chronic abductor deficiency of the hip after THA when techniques such as local tissue transfer are not possible. Longer-term follow-up is necessary before the technique can be broadly applied.[18]

References

1. Elbuluk, Ameer M et al. "Abductor Deficiency-Induced Recurrent Instability After Total Hip Arthroplasty." *JBJS reviews* vol. 8,1 (2020): e0164. doi:10.2106/JBJS.RVW.18.00164
2. Di Martino, Alberto et al. "Surgical repair for abductor lesion after revision total hip arthroplasty: a systematic review." *Hip international : the journal of clinical and experimental research on hip pathology and therapy* vol. 30,4 (2020): 380-390. doi:10.1177/1120700019888863
3. Klemm, Christian et al. "Outcome of Dual Mobility Constructs for Adverse Local Tissue Reaction Associated Abductor Deficiency in Revision Total Hip Arthroplasty." *The Journal of arthroplasty* vol. 35,12 (2020): 3686-3691. doi:10.1016/j.arth.2020.06.043

4. Kwon, Young-Min et al. "Risk Factors Associated With Early Complications of Revision Surgery for Head-Neck Taper Corrosion in Metal-on-Polyethylene Total Hip Arthroplasty." *The Journal of arthroplasty* vol. 33,10 (2018): 3231-3237. doi:10.1016/j.arth.2018.05.046
5. Lübbeke, Anne et al. "Results of surgical repair of abductor avulsion after primary total hip arthroplasty." *The Journal of arthroplasty* vol. 23,5 (2008): 694-8. doi:10.1016/j.arth.2007.08.018
6. Incavo, Stephen J, and Katharine D Harper. "Open Hip Abductor Tendon Repair into a Bone Trough: Improved Outcomes for Hip Abductor Tendon Avulsion." *JBJS essential surgical techniques* vol. 10,2 e0042. 2 Apr. 2020, doi:10.2106/JBJS.ST.19.00042
7. Whiteside, Leo A. "Surgical technique: Transfer of the anterior portion of the gluteus maximus muscle for abductor deficiency of the hip." *Clinical orthopaedics and related research* vol. 470,2 (2012): 503-10. doi:10.1007/s11999-011-1975-y
8. Ruckstuhl, Paul et al. "Functional Assessment and Patient-Related Outcomes after Gluteus Maximus Flap Transfer in Patients with Severe Hip Abductor Deficiency." *Journal of clinical medicine* vol. 9,6 1823. 11 Jun. 2020, doi:10.3390/jcm9061823
9. Christofilopoulos, Panayiotis et al. "Gluteus maximus tendon transfer for chronic abductor insufficiency: the Geneva technique." *Hip international : the journal of clinical and experimental research on hip pathology and therapy* vol. 31,6 (2021): 751-758. doi:10.1177/1120700020924330
10. Whiteside, Leo A. "Surgical technique: Gluteus maximus and tensor fascia lata transfer for primary deficiency of the abductors of the hip." *Clinical orthopaedics and related research* vol. 472,2 (2014): 645-53. doi:10.1007/s11999-013-3161-x

11.Chandrasekaran, Sivashankar et al. “Outcomes of gluteus maximus and tensor fascia lata transfer for primary deficiency of the abductors of the hip.” *Hip international : the journal of clinical and experimental research on hip pathology and therapy* vol. 27,6 (2017): 567-572. doi:10.5301/hipint.5000504

12.Maldonado, David R et al. “Combined Transfer of the Gluteus Maximus and Tensor Fasciae Latae for Irreparable Gluteus Medius Tear Using Contemporary Techniques: Short-Term Outcomes.” *JB & JS open access* vol. 5,4 e20.00085. 25 Nov. 2020, doi:10.2106/JBJS.OA.20.00085

13.Strømsøe, K, and K Eikvar. “Fascia lata plasty in recurrent posterior dislocation after total hip arthroplasty.” *Archives of orthopaedic and trauma surgery* vol. 114,5 (1995): 292-4. doi:10.1007/BF00452090

14.Drexler, Michael et al. “Acetabular cup revision combined with tensor fascia lata reconstruction for management of massive abductor avulsion after failed total hip arthroplasty.” *The Journal of arthroplasty* vol. 29,5 (2014): 1052-7. doi:10.1016/j.arth.2013.09.056

15.Wang, Kemble et al. “Vastus lateralis transfer for severe hip abductor deficiency: a salvage procedure.” *Hip international : the journal of clinical and experimental research on hip pathology and therapy* vol. 24,2 (2014): 180-6. doi:10.5301/hipint.5000099

16.Kohl, Sandro et al. “Hip abductor defect repair by means of a vastus lateralis muscle shift.” *The Journal of arthroplasty* vol. 27,4 (2012): 625-9. doi:10.1016/j.arth.2011.06.034

17.Fehm, Michael N et al. "Repair of a deficient abductor mechanism with Achilles tendon allograft after total hip replacement." *The Journal of bone and joint surgery. American volume* vol. 92,13 (2010): 2305-11. doi:10.2106/JBJS.I.01011

18.Drexler, M et al. "Reconstruction of chronic abductor deficiency after revision hip arthroplasty using an extensor mechanism allograft." *The bone & joint journal* vol. 97-B,8 (2015): 1050-5. doi:10.1302/0301-620X.97B8.35641