Narrative Review Article

Direct Anterior Versus Posterior Approach in Total Hip Arthroplasty: A Narrative Evidence Review of Recovery, Safety and Cost

Krrish Singh Sardar

University High School, 4771 Campus Dr, Irvine, CA 92612, Unites States

ABSTRACT

In the 2000s, new advances in imaging technologies and specialized surgical tables revitalized a 150-year-old method for total hip arthroplasty: the direct anterior approach. This newfound surge in usage of the direct anterior approach challenged the use of the more practiced posterior approach. In fact, studies show that many clinics and surgeons' websites state that the direct anterior approach is better for its muscle-sparing qualities and shorter recovery times. However, only a small percentage of these sites list the possible risks or cite peer-reviewed journals as evidence for their claims. This paper takes an evidence-based perspective using key factors such as the recovery process, recent use of inflammatory biomarkers, safety, and aggregated cost to evaluate whether the direct anterior approach truly is as effective and safe as these surgeons and clinics claim. Ultimately, the general consensus from current medical literature supports the posterior approach to total hip arthroplasty via consideration of the most important factors.

Keywords: Total Hip Arthroplasty; Direct Anterior Approach; Posterior Approach; Recovery Process; Nerve Damage; Inflammatory Biomarkers

INTRODUCTION

The direct anterior approach (DAA) to total hip arthroplasty (THA) gave surgeons an interval between two muscles, the tensor fascia lata and the sartorius muscles, to reach the hip joint. However, problems with visualization of this interval and the fragility of the neurovascular bundle discouraged surgeons from using the technique until advances in the early 2000s. Instead, surgeons relied on other approaches they deemed safer. The most common of these was and still is the posterior approach (PA); in particular, the Moore technique or Southern approach (1). In this technique, surgeons cut through the muscle fibers such as the gluteus maximus, the fascia lata, and gluteal fascia. Despite doing so, approaching from the posterior still allowed for the best exposure of the hip socket and less possible interaction with the fragile neurovascular bundle.

However, HANA orthopedic tables extend the leg to allow for easier visualization of the acetabulum. Additionally, new fluoroscopy tools guide surgeons to where the acetabulum is located within the hip via continuous x-ray emissions. With this new technology and more surgeons now using the DAA, many websites online now claim the advantages and shorter recovery times of the anterior approach. A study from 2017

Corresponding author: Krrish Singh Sardar, E-mail: superkrrish18@gmail.com.

Accepted March 24, 2026
https://doi.org/10.70251/HYJR2348.42199205

pulling data from 1855 surgeon-specific websites found that out of the websites that promote direct anterior approach, 45.2% of them state there is a quicker recovery and 28.1% of them state decreased pain (2). While these websites commonly mention benefits, only 4.7% of them detail any potential risk from the DAA. Furthermore, despite how many websites make claims regarding these surgeries, supporting peer-reviewed literature was identified on only 3.6% of these websites (2).

This low number of supporting peer-reviewed literature raises uncertainty about these claims.

Therefore, this paper will draw upon a wide array of peer-reviewed studies which compare the two most popular approaches to THA in order to form an evidence-based conclusion on whether one approach has advantages or risks that tangibly outweigh those of the other approach. This conclusion will take into account three factors: the recovery process, safety, and financial cost.

THE RECOVERY PROCESS

Many private clinics and surgeons' websites advertise the DAA's shorter recovery times.

However, medical literature and studies have shown that the recovery process evens out after the first 6 months. While it may seem like the DAA should take less time to recover because it does not have to cut through muscles like the PA, these muscle-sparing effects are primarily relevant to the short-term recovery process, not the overall length of recovery time.

This conclusion is supported by numerous studies. The best example of this is a large meta-analysis from 2021, which took into account 22,698 adult patients (DAA group = 2947 patients and posterior group including 19751 patients). This meta-analysis study employed the Harris Hip Score (HHS) to quantify the progress of recovery for patients after the DAA (3). Utilizing HHS, the study concluded that while there is a statistically significant difference in HHS differences before the 6-month mark, after the 6-month mark, HHS converges (3).

Other studies affirmed that there is little to no difference in the long-term recovery process found between the DAA and PA. One example is another meta-analysis from 2018 which analyzed 9 randomized clinical trials with a total of 754 total hip arthroplasties (377 = DAA group and 377 = PA group). This meta-analysis analyzed different factors such as length of hospital stay, HHS, and pain levels. The study found a statistically significant difference in HHS at 2 weeks and 6 weeks, with DAA being significantly better (4). However, at 12-week and 1-year follow ups, the HHS scores did not have a statistically significant difference (4). Additionally, four studies within this meta-analysis totaling 290 total hip replacement surgeries showed no significant difference between DAA group and PA group in terms of length of hospital stay (4). To quantify pain measurements, this meta-analysis relied on the visual analog scale (VAS), in which patients mark how severe their pain was on a 10 cm scale (4). At 24 hours, 48 hours, and 72 hours the study found a statistically significant decrease in pain associated with the DAA group at all of these times with weighted mean difference at each increment (24 h, WMD = − 0.71, 95% CI − 0.90 to − 0.51, $p = 0.000$; 48 h, WMD = − 1.55, 95% CI − 2.24 to − 0.86, $p = 0.000$; 72 h, WMD = − 1.56, 95% CI − 2.64 to − 0.48, $p = 0.005$) (4).

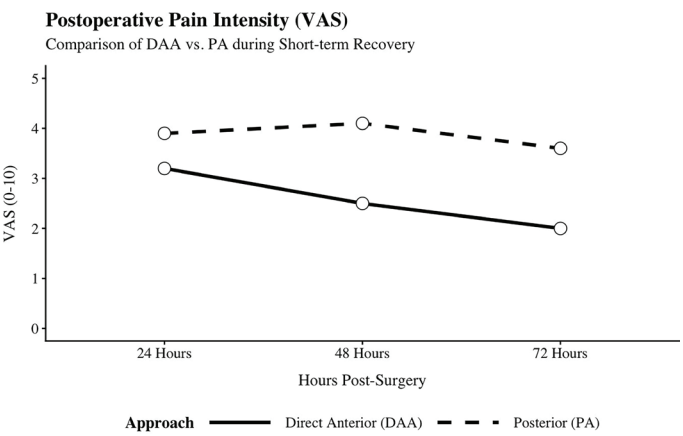

Figure 1. *This graph displays the visual analog data found in the meta-analysis by Wang et al., where patients rated how severe their pain was on a scale of 1–10 at different periods of time after the surgery (4). Graphic made by author using ggplot2.*

Figure 1 summarizes the meta-analysis' VAS data hours after the surgery for patients. Supporting the results from the 2021 study, this large meta-analysis found statistically significant pain reduction in the first 3 days and a better HHS at 2 and 6 weeks but no significant difference in hospital stay. As further evidence of the credibility of these findings, this meta-analysis quantifies pain measurement through VAS, making it more generalizable than subjective reporting is.

Despite this seemingly accurate methodology, in the conclusion of the meta-analysis, the authors state that

there is a need for more high-quality RCTs, as the ones they used were of low to middle quality.

Interestingly enough even with this minor flaw in their methodology, the study still found no significant difference in hospital stay and no significant difference in postoperative outcome after 6 weeks. This suggests that while DAA may ease short-term postoperative pain, long-term DAA and PA outcomes are comparable.

However even studies with larger limitations still came up with the same conclusion, supporting the general trend further. One example of this is a study from 2017 which evaluated postoperative results of 92 total hip replacements performed by one surgeon (44 DAA and 48 PA). Their results indicated a statistically significant reduction in hospital stay with the direct anterior approach group staying 3.8 ± 1.7 days and posterior approach group staying 4.9 ± 2.3 days (5). Additionally, their results indicated statistically significant reduction in use of assistive devices with the DAA, and reportedly pain was significantly lower (5). The HHS, commonly used amongst studies, is a 100-point test taking into account pain, function, deformity, and range of motion of the hip through several tests. In this 2017 study, they found a statistically significant difference in HHS at the end of the 6 weeks with the DAA group at 85.7 ± 5.4 and PA group at 81.3 ± 6.1 ($p<0.05$) (5). However, past this 6-week period, the study found no statistically significant differences between HHS with DAA group at 93.4 ± 4.7, and in PA group 92.3 ± 5.3 ($p>0.05$) (5).

Table 1 summarizes all statistics measured from this study, which had many limitations in its methodology. The higher pain reported in recovery had no objective, standardizable quantification unlike the 2018 study which utilized VAS and therefore was liable to fluctuation via patient subjectivity. Still, the general trend was supported in both studies with pain being higher in PA in initial post-operational hours. Another key limitation is that only one surgeon was responsible for all of the cases from the DAA and PA, meaning that any difference in their level of experience with each approach could have skewed the results in a way that outweighed the broader advantages and disadvantages of each method. Despite all these flaws, it still supported the general trend found in the short term and long term recovery of DAA vs PA. This general trend is identified in the figure below.

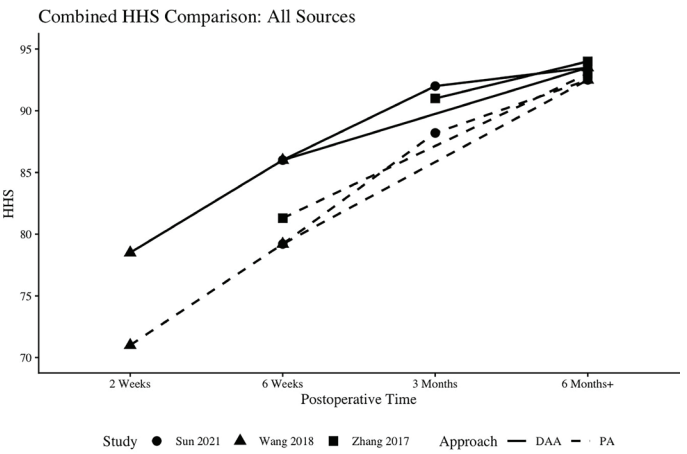

Figure 2. *Combined XY graph representation of recovery process according to these studies by Zhang et al., Wang et al., and Sun et al. about the comparison in HHS scores between direct anterior approach and posterior approach to THA in relation to time (3-5). (Harris Hip Score is a score used to measure hip functionality through a variety of tests.) Graphic made by author using ggplot2.*

Table 1. *The table below summarizes the metrics found from Zhang et al. in their 2017 study, which analyzed 92 total hip replacements performed by one surgeon and put together mean and standard deviation for each factor (5). Additionally, the HHS measures hip functionality. Graphic made by author using ggplot2.*

Recovery Metrics of DAA vs PA			
	DAA	**PA**	**Significance**
Hospital Stay (days)	3.8 ± 1.7	4.9 ± 2.3	$p < 0.05$
Blood Los (mL)	238.0 ± 55.3	387.0 ± 61.2	$p < 0.05$
Assistive Device Use (days)	24.6 ± 7.8	31.7 ± 10.2	$p < 0.05$
HHS (6 Weeks)	85.7 ± 5.4	81.3 ± 6.1	$p < 0.05$
HHS (Last Follow-up)	93.4 ± 4.7	92.3 ± 5.3	$p < 0.05$

As shown in Figure 2, a combined graphical representation of HHS scores in all three studies for PA vs DAA, even studies with major limitations, still agree with the largest and most generalizable studies. Therefore, with respect to the recovery process, a general consensus can be reached that the DAA is superior in short-term pain management and functionality through approximately the first 6 months.

However, beyond the first 6 months, the DAA and PA converge to equivalent postoperative results in functionality as measured by the HHS and VAS. These results prove that while the DAA may lessen pain, it does not decrease total recovery time.

INFLAMMATORY BIOMARKERS

As mentioned above, a subjective measurement of pain poses issues to generalizability. However, researchers in a 2000 study determined that an increase in intracellular protein serum creatine kinase (CK) correlated to an increase in muscle damage in surgical operations (6). This insight offered a new methodology to compare the DAA against the PA: inflammatory biomarkers.

A recent study utilized inflammatory biomarkers to objectively assess the extent of muscle damage rather than let patients subjectively assess pain on the visual analog scale (7). These findings contradict those of the VAS in Figure 1.

This contradiction prompted other researchers to utilize inflammatory biomarkers to diagnose the extent of muscle damage in the PA and DAA. While the VAS in Figure 1 might predict a lower concentration of CK and inflammatory biomarkers in the DAA, since it operates through an intermuscular interval and therefore spares muscle tissue, a study from 2022 found that inflammatory markers were actually higher within the DAA group than the PA group (7).

This study, unlike other studies using inflammatory biomarkers, tracked patients' CK levels beyond the postoperative day throughout the rehabilitation process to track if the DAA weakened muscles needed in rehabilitation, therefore delaying muscle damage recovery.

The study's results, found in Figure 3, confirmed a statistically significant increase in the DAA group over the PA group in CK levels 1, 4, 7, 10, and 14 days after operation (7). These researchers attributed this increase to the DAA's use of retractors, which hyperextended muscles such as the tensor fascia lata and rectus femoris.

These findings therefore suggest that, even when

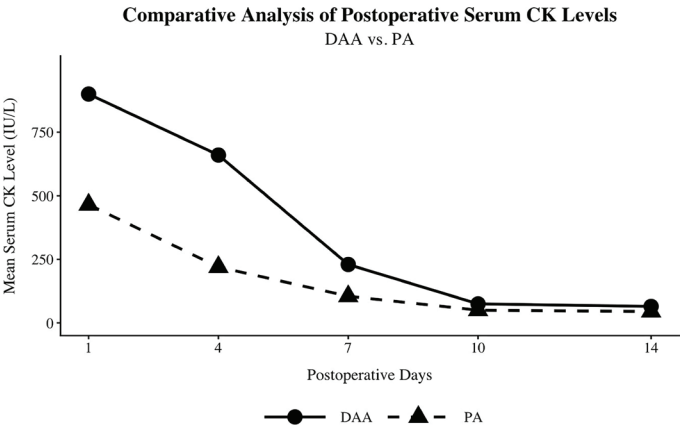

Figure 3. *XY comparison plot of CK levels summarizing Maezawa's 2022 study results about using inflammatory markers to track pain in the two approaches (DAA and PA) in terms of time after post operative days and mean CK levels across each group (7). Graphic created by author with ggplot2.*

using quantitative evidence such as inflammatory biomarkers, the DAA is actually more invasive than the PA. This study exhibited a rigorous methodology, with each surgeon being highly experienced in his or her respective approach (DAA surgeon with 8 years of experience and more than 100 THAs). However, this study only tracked 71 patients, and more studies must be conducted in tracking inflammatory biomarkers during rehabilitation with each approach to find definitive, generalizable results and provide clarity to the original contradiction between the self-reported measurement of pain and the quantitative measurement of invasiveness. It should be noted that, while higher CK levels correlate to higher levels of tissue damage and pain, there are other factors, such as injuries not dealing with muscles such as nerve damage or wound healing, involved in the overall functional outcome and invasiveness of THA, as described in the section below. Therefore, as of now, it cannot be said that higher CK levels alone in DAA directly correlate to worse functional outcomes of patients or higher invasiveness.

SAFETY

The DAA's easier short-term recovery comes at the cost of risking harmful postoperative complications. Several studies comparing the DAA with PA have found that the DAA has higher risks of nerve damage, wound-healing complications, and post-surgical complications that require reoperation.

Nerve Damage

Usually, only the DAA has the potential to harm the neurovascular bundle on the anterior side otherwise known as the femoral nerve, as the direct anterior approach requires a high level of visualization skills from the surgeons to find the interval between the tensor fascia lata and sartorius. Specifically, when going through this interval, surgeons can misplace the retractor either superficial to iliopsoas or through the muscle bulk at the pelvic brim, resulting in the tip of the tractor lying just over the femoral nerve (8). This misplacement can then cause femoral nerve palsy, which worsens quality of life. To make matters worse, this damage to the femoral nerve is difficult to diagnose early on and is therefore diagnosed later (9).

However, both the DAA and PA can damage the sciatic nerve. A recent study from 2024 conducting a retrospective analysis on sciatic nerve palsy (SNP) in the DAA and PA found that in 4045 DAAs, 7 SNPs occurred, while in 8854 PAs, 10 SNPs occurred, meaning that the incidence rate was 0.17% the DAA and 0.11% for PA ($p = 0.05$) (10). Therefore, the risk of SNP is similar for both approaches.

Given that DAA-specific femoral nerve injury is twice as likely to occur as approach-agnostic SNP, the DAA is statistically more likely to contribute to nerve damage overall.

Wound Healing

Aside from nerve injuries, the DAA may be associated with higher incidences of wound-healing complications. A study from 2010's review of 800 DAAs found a 4.6% rate of serious wound-healing complications, which caused a 1.6% reoperation rate due (11). Wound-healing complications may lead to an increased infection rate, making the DAA more dangerous. These complications are mainly attributed to the thinness of the skin found in the anterior side of the hip rather than the more thick skin found in the posterior side of the hip. Therefore, the DAA poses a higher risk of infection and wound-healing complications.

More broadly, wound-related complications within the DAA result in greater reoperations than the PA. A retrospective study about the prevalence of reoperations found that 7/505 DAA THAs required reoperation while only 3/1228 PA THAs required reoperation ($p=0.007$) (12). Therefore, according to the same statistics represented graphically in Figure 4, DAA poses a significant increase in complications that require additional reoperations.

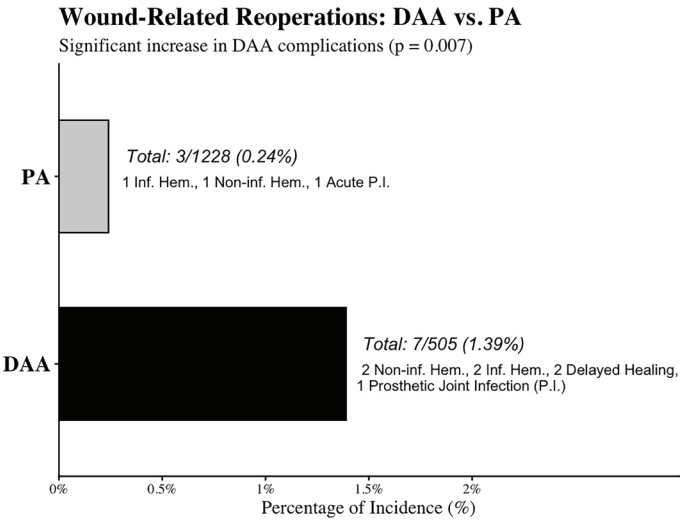

Figure 4. *A horizontal bar graph summarizing results from Christensen et al's study in 2014 where they arranged two groups of patients based on approach to THA (DAA n =505 and PA n=1228) and analyzed corresponding incidences to certain injuries or postoperative complications incurred after THA (12). Graphic made by author using ggplot2.*

Therefore, accounting for the risks of nerve injury, wound-healing complications, and wound complications requiring reoperations, the PA is generally less prone to complications than the DAA.

COST

Compared to the PA, the DAA has a higher associated cost due to the newer technologies and accompanying revisions or post-surgical complications. Studies analyzing these two factors therefore suggest it may be cost-efficient for clinics to use the PA to minimize costs for both providers and patients.

Due to the risk of revisions and reoperation, cost correlates with safety. One meta-analysis analyzed the probabilities of reoperation for each approach with regard to all potential complications alongside associated cost. This meta-analysis from 2023, which takes into account 30 clinical trials and 11,562 patients (DAA = 5,781, PA = 5,781), uses stratified probability to identify projected average sum of costs for the entire aggregated set of patients in each group (5,781). Specifically, it calculates incidence rate of reoperations and possible treatments hospitals may need to provide after each surgery and then adds the cost for this large sum of patients. Through this methodology, the costs were determined as $699,517.33

for DAA group (n = 5,781) and $169,785.76 for the PA group (n = 5,781) (13).

The data, summarized in Figure 5, which shows stratified calculation of cost across a large group of patients, suggests that the PA has the potential to save hospitals hundreds of thousands of dollars across all patients due to the reduced risks of reoperation or postoperative complications. The sweeping nature of this meta-analysis, taking into account 30 clinical trials and 11,562 patients, means that its findings are most likely generalizable.

In addition to possible surgical revisions and reoperation, the newest technologies accompanying the DAA such as the specialized orthopedic table and fluoroscopy tools to aid visualization factor into the cost. The DAA surgical tables include specialized orthopedic tables which usually cost around 100,000 dollars (14). Additionally, C-arm fluoroscopy, used to help surgeons properly place the hip implant in DAA, range from $12,000 to $85,000. However, the one-time impact of equipment costs is minimal compared to the ongoing costs of patient complications.

Overall, the PA has lower upfront and ongoing costs than the DAA for clinics to perform. At a time when some hospitals face budgetary concerns, these savings may meaningfully factor into a hospital's decision regarding which approach to take.

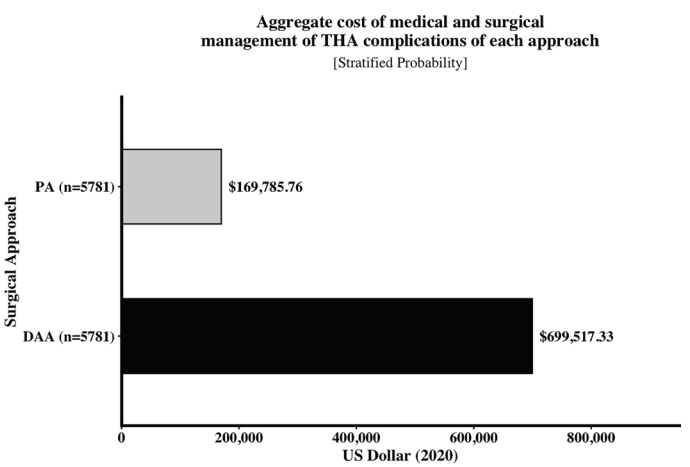

Figure 5. *A horizontal bar graph made using data from Awad's meta-analysis that attributes and stratifies possibilities of post-surgical complication or revision and thereby adds the corresponding costs for each of these revisions for a large aggregate group of patients (n=5,781) for both DAA and PA groups (13). Graphic made by author using ggplot2.*

CONCLUSION

Current research disproves the preponderance of claims by surgeon- and clinic-owned websites that the recovery process for the DAA is faster than that for the PA. While subjective, patient-reported pain is lower in the early phase of the recovery process for the DAA than it is for the PA, an objective measurement of inflammatory biomarkers suggests that the DAA, counterintuitively, causes more muscle damage and is therefore the more invasive procedure. Additionally, the DAA poses a greater risk of nerve damage, wound healing complications, and the need for reoperation. With these risks comes a higher associated cost for both the patient and clinic. Given this information, the DAA's advantages are minor and limited to the first six months of recovery.

This is not to say that surgeons should universally switch to the PA. This analysis does not account for individual surgeons' level of experience with both approaches. However, surgeons and healthcare providers, as well as their websites, must provide an accurate and precise description of each approach's risks and benefits that cites peer-reviewed research.

Furthermore, while current medical literature points to this objective conclusion, further research should be conducted. Specifically, larger RCTs that further investigate objective measurements for pain and damage would help reconcile contradictions between early THA studies that measure CK levels.

In conclusion, although the DAA offers reduced patient-reported pain during the short-term recovery process, the PA is safer and more cost-effective by way of a reduced risk of complications and the need for reoperation.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

1. Anyanwu E, Ekezie J, Obikili E, Onyemaechi N. Anatomical basis for surgical approaches to the hip. *Ann Med Health Sci Res.* 2014; 4 (4): 487-494. https://doi.org/10.4103/2141-9248.139278
2. Shofoluwe AI, Naveen NB, Inabathula A, Ziemba-Davis M, Meneghini RM, Callaghan JJ, et al. Internet promotion of direct anterior approach total hip arthroplasty by members of the American Association

of Hip and Knee Surgeons. *J Arthroplasty*. 2018; 33 (1): 167-170.e1. https://doi.org/10.1016/j.arth.2017.08.015
3. Sun XD, Zhao X, Zhou L, Su Z. Direct anterior approach versus posterolateral approach in total hip arthroplasty: a meta-analysis of results on early post-operative period. *J Orthop Surg Res*. 2021; 16 (1): 53. https://doi.org/10.1186/s13018-021-02218-7
4. Wang Z, Hou J, Wu C, Zhou Y, Gu X, Wang H, et al. A systematic review and meta-analysis of direct anterior approach versus posterior approach in total hip arthroplasty. *J Orthop Surg Res*. 2018; 13 (1): 229. https://doi.org/10.1186/s13018-018-0929-4
5. Zhang YJ, Li J, Qi K, Xue CC, Xu WD. Comparison of efficacy and safety between the anterior and the posterior approaches to total hip arthroplasty. *J Peking Univ Health Sci*. 2017; 49 (2): 201-205.
6. Laurence AS. Serum myoglobin and creatine kinase following surgery. *Br J Anaesth*. 2000; 84 (6): 763-766. https://doi.org/10.1093/oxfordjournals.bja.a013590
7. Maezawa K, Nozawa M, Gomi M, Sugimoto M, Maruyama Y. Changes in serum creatine kinase and C-reactive protein after posterior and direct anterior approaches in total hip arthroplasty. *Hip Int*. 2022; 32 (5): 591-595. https://doi.org/10.1177/1120700020978643
8. Patton RS, Runner RP, Lazarus D, Bradbury TL. Femoral neuropathy following direct anterior total hip arthroplasty: an anatomic review and case series. *J Surg Case Rep.* 2018; 2018 (9): rjy243. https://doi.org/10.1093/jscr/rjy171
9. Yang IH. Neurovascular injury in hip arthroplasty. *Hip Pelvis.* 2014; 26 (2): 74-80. https://doi.org/10.5371/hp.2014.26.2.74
10. Coden GS, Olsen AA, Schoeller LE, Niu R, Pichiotino ER, Freccero DM, et al. Similar incidence of postoperative sciatic nerve palsy in direct anterior and posterior approach total hip arthroplasty. *Hip Int*. 2024; 34 (4): 523-529. https://doi.org/10.1177/11207000241232813
11. Jewett BA, Collis DK. High complication rate with anterior total hip arthroplasties on a fracture table. *Clin Orthop Relat Res*. 2010; 469 (2): 503-507. https://doi.org/10.1007/s11999-010-1568-1
12. Christensen CP, Karthikeyan T, Jacobs CA. Greater prevalence of wound complications requiring reoperation with direct anterior approach total hip arthroplasty. *J Arthroplasty*. 2014; 29 (9): 1839-1841. https://doi.org/10.1016/j.arth.2014.04.036
13. Awad ME, Farley BJ, Mostafa G, Darwiche HF, Saleh KJ. The risk of hospital readmission, revision, and intra- and postoperative complications between direct anterior versus posterior approaches in primary total hip arthroplasty: a stratified meta-analysis and a probability-based cost projection. *Hip Int*. 2022; 32 (6): 771-781.
14. Sculco TP. Anterior approach in THA improves outcomes: opposes. *Orthopedics*. 2011; 34 (9): e531-e533. https://doi.org/10.3928/01477447-20110714-29