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GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

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9. ხელმძღვანელი შეიძლო აღჭურვილი გამოყენებით ბაზამდე და უფრო გამოყენებით პირობებში ჩატარდება. გამოყენებული უფრო ელექტრო მომარხით და მოქმედა; გამოყენება თავისუფლად სწორედ პირობებში, ბაზაში. დარჩენილი მისი ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში, ბაზაში.

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STRATEGIES…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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INNOVATIONS IN ORTHOPEDIC SURGERY: MINIMALLY INVASIVE TECHNIQUES FOR JOINT REPLACEMENT AND REPAIR

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Abstract.

The scientists compared the outcomes of a minimally invasive operation approach (MIO) to a conventional poster lateral (PL) method in overall hip replacement (OHR) in terms of itchiness, damage to muscles, and bleeding. The factors that researchers examined were the levels of Haemoglobin (Hg), a marker for oxygen depletion, the quantity of Interleukin-6 (IL6), a marker for inflammation, the heart-type fatty acid binding protein (HTFABP), and the health of the muscles. The study's findings showed that IL6 content increased beyond pre-operative levels as a result of the two surgeries. At 6 hours after surgery, the mean IL6 concentration in the PL group was 79.6 pg/ml while in the MIO group it was 76.4 pg/ml. The highest values after 24 hours of therapy were 100 pg/ml in the PL group and 92.3 pg/ml in the MIO category. In each category, IL6 levels had dropped up to this point. The post-operative mean HTFABP concentration in the MIO organization was greater (12.5 mg/l) than in the PL organization (18.3 mg/l) in terms of muscle damage. One day after surgery, however, it reached an apex and began to decline in both groups. The amounts of Hg lost throughout the procedure decreased for both sets. 12.5 g/dl of mercury was present. The MIO grouping had PL 72 hours following a procedure, while the PL grouping had 10.3 g/dl. Between the two surgical methods, there were no obvious differences in bleeding, muscle damage, or edema. These results led the researchers to draw the conclusion that there were little differences between the MIO anterior method and the traditional PL technique in terms of muscle damage, blood loss, or irritability. The lack of a learning curve in the study may account for the lack of alterations seen, they hypothesized, rendering the use of the term "MIO" in describing the approach as less traumatizing dubious. The study's methodology, sample sizes, and all other relevant material were left out, making it impossible to evaluate the study's validity and generalizability in its entirety.

Key words. MIO, OHR, Muscle damage, Blood loss, IL6.

Introduction.

OHR has evolved into one of those most commonly effectively conducted repairs in the field of orthopedic surgery. Since its development nearly 45 years ago, a complete replacement of a knee or hip joint has been done to safely and securely alleviate suffering, enhance operation, and regain mobility. The ‘stress reaction’ to process is the term used to define a number of well-known endocrine in metabolism, hematological, and immune alterations which are induced by operation [1].

Quicker recuperation may come from fewer clots, less tissue injury, and less irritation, and these aspects were heavily promoted by factories and some orthopedic physicians with the goal of supporting minimum or slightly intrusive surgeries. Recent meta-analytics indicate that while longer operating instances, laparoscopy offers the benefits of quicker healing and lesser length of hospitalization for procedures like minimally invasive colonic removal, appendectomy, spleen removal, and inguinal leakage treatment. There aren't many scientific papers regarding the outcomes of simpler orthopedic surgical methods [2].

The benefits include enhanced physical appeal to remarkably low complications and rapid healing timeframes. The outside rotators and thighs are bluntly using the PL approach for OHR, a large incision is made across the greater trochanter. Of all the methods described for the hip area, this one requires the deepest opening of the muscular barrier [3].

There are no tissues severed during the surgical procedure, and the opening is shorter than ten millimeters; nevertheless, significant force must be used to get a decent view. When pressure is applied, there may be serious tissue harm and significant inflammation. We wondered whether safe front approaches resulted in less surgical trauma than traditional posterior approaches. HTFABP is a reliable indicator of power cell deterioration. Muscles cells' watery plasma is very rich in 12.5-kDa HTFABP. This little chemical leaves the injured tissue post-operative 24 hours of therapy were 100 pg/ml in the PL group and 92.3 pg/ml in the MIO category. In each category, IL6 levels had dropped up to this point. The post-operative mean HTFABP concentration in the MIO organization was greater (12.5 mg/l) than in the PL organization (18.3 mg/l) in terms of muscle damage. One day after surgery, however, it reached an apex and began to decline in both groups. The amounts of Hg lost throughout the procedure decreased for both sets. 12.5 g/dl of mercury was present. The MIO grouping had PL 72 hours following a procedure, while the PL grouping had 10.3 g/dl. Between the two surgical methods, there were no obvious differences in bleeding, muscle damage, or edema. These results led the researchers to draw the conclusion that there were little differences between the MIO anterior method and the traditional PL technique in terms of muscle damage, blood loss, or irritability. The lack of a learning curve in the study may account for the lack of alterations seen, they hypothesized, rendering the use of the term "MIO" in describing the approach as less traumatizing dubious. The study's methodology, sample sizes, and all other relevant material were left out, making it impossible to evaluate the study's validity and generalizability in its entirety.

Key words. MIO, OHR, Muscle damage, Blood loss, IL6.
According to [9] idealism, these quickly developing technology are producing a lot of innovations, investing more resources, being adopted by practitioners at a faster rate, and having a big medical effect. It can be helpful to identify patterns and potential paths in the subject of knee replacement and to periodically track technical progress using patent repositories. Modern robotics has made acetabular placement easier with precise, but historical data are needed to determine how economical it is. This approach [10] post tries to summarize along with the developments with advancements in full hip arthroscopy, including unique to patients equipment with digital printing to dual flexibility joints and augmented reality. This exemplifies the controversy that would surround the procedure over the ensuing ten years. The uneven spread of arthroscopic rotator cuff repair throughout the country demonstrates that different areas’ Medicare patients weren't given comparable access to such treatments and that these differences persisted as time passed. Further study [11] is required to determine whether this subsequent acceptance causes disparities in the standard of care and cost of surgery provided to patients in these areas.

The goals of the primary curricular program for orthopedic and neurosurgery residencies are evolving primarily in accordance with shifts in healthcare delivery models and the quickening development of technological advances. Approached [12] for 3D modeling and sophisticated AR simulations might be utilized. Upcoming neurologists and orthopedic surgeons must understand the principles of continuing education in resident programs if they are to be successful in the individualized methods of surgery pain treatment. In the hip and knee, traditional arthroscopy is being replaced by the innovative and rising in popularity robotic-assisted arthroplasty, although it currently is not being researched in shoulder region. To provide a narrative examination of research on the background and potential future developments of robotic aid and technology advancements in total knee arthroscopy [13].To increase the efficacy and dependability of such gadgets, a number of major issues in orthopedic prostheses engineering have to be resolved [14]. The article addresses the additional advancements in the industry and provides future orthopedic prosthetic designs. They can continue to improve the lives of people with orthopedic disorders and advance the practice of orthopedic prostheses by solving those issues.

Improvements in musculoskeletal care and quality of life are being made possible by significant advancements in the treatment of patients. As with every breakthrough, sometimes originally attractive developments have been later proven to have contradictory results in science. Orthopedic therapies are, moreover, especially vulnerable to early acceptance and market pressures for procedures that are not yet backed by the findings of science [15]. The objective of [16] the current study is to evaluate a biomechanical, non-invasive intervention's long-term impact in frequency of OHR and use about medical services over five years. The prevention of OHR and chronic knee discomfort are just two benefits of this biomechanical, non-invasive technique that saves money on healthcare resources. It has been suggested that overall hip replacement (OHR) utilizing minimally invasive techniques (MIO) is less stressful than using standard procedures in orthopedic surgery for joint replacement and repair. Whether an anterior MIO approach causes less muscle damage and inflammation than the traditional posterolateral (PL) method was the main objective of this investigation.

Materials and Methods.

Utilizing minimally invasive methods in orthopedic surgery to replace and repair joints surgical techniques, the posterolateral approach, the anterior strategy, and statistical analysis all demonstrate that the suggested procedure performs. 25 people were hospitalized at our facility between May 2020 and December 2021 for bilateral hip replacements and joined in this non-randomized, non-blinded study. Every individual received verbal and in-writing research data, and their informed permission was collected. Information on demographics, an individual's body composition directory, and an evaluation using the American Society of Anesthesiologists (ASA) method was obtained prior to surgery.

Muscular injury has been assessed using the heart-type fatty acid binding protein (HTFABP) measure. For the purpose of identifying harm to muscles, comparing Haemoglobin to HTFABP, along with validating or debating outliers, Haemoglobin was also tested. Excluding injured muscles, potential tissue harm was detected using serum kinases choline (kc), aspartate aminotransferase (ASAT), and this enzyme (LDH). This was additionally decided that Interleukin-10 (IL-10) would be used to keep an eye on a potential regulation backlash.

Samples have been taken prior to the incisions as well as at 2, 4, 6, 24 and 72 hours thereafter. Following that, blood drops were spun up for 12 minutes at 3500 rotations per second. The underside was separated, and its plasma was kept in a spare tube. The liquid was distributed among many tubes after repeating the operation. Before the investigation was over, the extracts were preserved at -90oC. These were first kept at -30oC. Although IL6 is an unstable cytokine, the entire operation was carried out with a compact spinning at a patient's mattress to minimize the period of the collection and centrifugal motion. At 6, 24, and 72 hours following the procedure, hemoglobin levels were assessed at the nearby laboratories. The regional laboratory's Beckmann-CoalterSynchronLXi 725 also measured the levels of myoglobin that KC, ASAT, and LDH. ELISA testing was used to assess the levels of IL6 and IL10. Hycult Biotechnology graciously donated the HTFABP ELISA, which was carried out at the College of Limburg.

Methods for surgery.

The study involved five competent surgeons who execute more than 65 hip replacements annually. Three operators employed an uninterrupted lateral method, whereas two used a posterior technique. Every doctor participated in an autopsy session prior to conducting the less invasive method. A competent surgeon in MIO worked on the initial three hips. Two technicians performed on each MIS patient. The control technique was the anterior strategy, which was performed by two physicians independently.

Posterolateral strategy.

A posterolateral strategy was employed for the operation on the placebo sample. The positions of patients were horizontal.
decubitus. The twisted wound was done over the more powerful trochanter and posteriorly. The exterior rotators and thigh muscles were separated. A posterior capsule puncture in the shape of an H was then made. The tip of the femur was eliminated, the hip joint was dislocated, while a surgical extraction of the collum was done employing an oscillation blade. The acetabulum was reamed after acetabular osteoarthritis and labrum fragments were removed, and the vessel was then placed in the position of choice.

Injection and end rotation were used to expose the bone's entrance site. The artificial joint was put in after the shaft of the femur was rasped. Reefing stitches were used to conduct a capsule closure after ultimate reductions. The upper ligament and the outside rotators were reattached. The layer of skin and skin layer were eventually closed.

Anterior strategy.

To achieve adequate knee being exposed, the surgical procedure was carried out using only one front incision and specifically created retractors. On the surgical table, sufferers were positioned recumbent with their legs hanging loose. The opening occurred in the perceptible space separating the transversal muscle lata and sartorius skeletal muscles, 4–5 centimeters away from the ASIS or front inferior pelvic spines. The measurement of the object as a whole incision was roughly equal to the cup's anticipated diameter. To protect the posterior femoral cutaneous nerves, subcutaneous fat was bluntly removed using extra caution. The medial edge of the transverse tissue lata muscle's fascia was removed, and the descending sections of the lateral femoral circumflex arteries were tied off. The capsule that protects the joint was then sliced in a configuration of an H.

As much as feasible, the spleen was separated from the intertrochanteric line on the median and ventral sides, and the front labrum was eliminated. An oscillation blade was employed to make the femoral neck cut while the femoral head was in a neutral state, and a disc composed of bone had to be removed. With the aid of a helical extractor, the core was eliminated. The measurement of the object as a whole incision was roughly equal to the cup's anticipated diameter. To protect the posterior femoral cutaneous nerves, subcutaneous fat was bluntly removed using extra caution. The medial edge of the transverse tissue lata muscle's fascia was removed, and the descending sections of the lateral femoral circumflex arteries were tied off. The capsule that protects the joint was then sliced in a configuration of an H.

By placing a support beneath the outermost thigh, lengthening the pelvis, tugging the leg in a four-pointed arrangement, and hooking through the calcar ventral at the entrance into tibial shafts were exposed. A capsulotomy was done at the bigger trochanter's foundation, while the larger trochanter was then enclosed with a retractor. The prosthesis was inserted after the shaft of the femur was rasped. Final reductions followed with capsule repair using reefing stitches, cartilage reattachment, and then cosmetic sealing.

### Table 1. The mean levels of hemoglobin, which LDH, CK, and ASAT over a period of time (SEM).

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<th>6 Hours</th>
<th>4 Hours</th>
<th>2 Hours</th>
<th>Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAT</td>
<td>42.36±2.54</td>
<td>40.77±2.84</td>
<td>27.48±1.64</td>
<td>26.06±1.22</td>
<td>23.19±1.39</td>
<td>23.84±1.63</td>
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<tr>
<td>MIS</td>
<td>30.10±3.59</td>
<td>30.12±2.82</td>
<td>23.24±0.92</td>
<td>21.73±0.73</td>
<td>18.69±0.52</td>
<td>22.16±1.73</td>
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<tr>
<td>LDH</td>
<td>342.02±12.95</td>
<td>307.02±19.38</td>
<td>309.62±12.46</td>
<td>305.72±12.82</td>
<td>306.72±16.52</td>
<td>325.02±16.87</td>
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<tr>
<td>MIS</td>
<td>338.62±17.76</td>
<td>264.52±13.24</td>
<td>295.82±13.57</td>
<td>307.82±18.72</td>
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<td>376.52±41.36</td>
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<td>CK</td>
<td>609.62±95.98</td>
<td>796.32±110.94</td>
<td>383.22±64.54</td>
<td>301.32±47.62</td>
<td>179.52±28.82</td>
<td>73.12±8.33</td>
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<tr>
<td>MIS</td>
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<td>596.52±140.92</td>
<td>364.02±51.17</td>
<td>289.42±40.75</td>
<td>152.32±14.65</td>
<td>78.32±10.24</td>
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<td>Myo</td>
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<td>367.42±53.19</td>
<td>303.49±35.30</td>
<td>320.22±52.42</td>
<td>315.14±63.77</td>
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<tr>
<td>MIS</td>
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<td>366.63±48.43</td>
<td>300.37±30.46</td>
<td>33.74±8.05</td>
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</table>

### Statistical analysis.

Utilizing SPSS 12.0, associations were computed using database-stored data. After applying the statistical method, the homogeneity of variance and normal distribution of all variables were checked. Patient features and surgery results were analyzed using the learning t-test. With the aid of Hochberg's technique and a GLM Repeat Measurements Evaluation, the values and indicators of hemoglobin were examined. When necessary, The Greenhouse-Geisser reduced findings were utilized to modify the analyses, including the within-subject factor(s) into account for heterogeneity of variances and covariance. The value of Alpha was 0.10.

### Results.

Patient characteristics: Aged (69.3 years vs. 69.70 years) and length (178 centimeters vs. 181 centimeters; an insignificant difference) weren't different between both groups.

The MIO organization's BMI, or body composition, was significantly greater (28.3 vs. 31.3). In the PL category, there were 4 male and 12 women, while in the MIO category, there were 6 male and 8 women. In the PL group, 4 individuals got general anaesthetic and 8 individuals underwent spinal anesthesia. The ratio in the MIO group was 10 to 2. Patients' ASA grades (1-5) for PL had a score of 4/7/0/0, whereas MIO had a score of 7/5/0/0.

Operative data: Compared to the PL category, the MIO category's treatment was prolonged (83.0 min vs. 97.6 min). However, the anticipated quantity of blood lost throughout the surgery wasn't substantially higher (545 ml vs. 735 ml). The MIO group's incisions were substantially shorter (19.5 cm vs 8.8 cm) than that of the control category.

Inflammatory with muscle harm: According to the HTFABP data (Fig. 1), the surgery itself caused a considerable and quick rise in the level of HTFABP in the blood. This depicts the damage caused to tendons that causes the loss of cell membranes. Both surgery populations experienced comparable muscular cell injury. The area under the curve, which depicts the aggregate quantity of muscle tissues injured following an operation, is comparable in each group. The MIO category's variance is significantly higher versus the PL groups.

Following surgery in both surgical categories, there was a considerable elevation in IL6 levels (Figure 2) due to the stress on the individual's muscular tissues, as indicated by HTFABP. In both surgery categories, there were no appreciable differences in the highest and overall levels of inflammatory.

A single person in each group exhibited measurements that were over two averages above the mean. The two individuals
were excluded from the evaluation because they were viewed as exceptions. This occurred both with IL6 and HTFABP. The pattern of the HTFABP and hemoglobin (Table 1 displays hemoglobin concentrations) was consistent.

**Amounts of hemoglobin.**

The following (fig. 3) displays the hemoglobin (Hg) levels. The statistics from both categories differed not significantly from one another. A patient in the MIO group with impaired cardiovascular health required one blood transfer. The afterward hemoglobin level for this patient was 9.9 g/dl. After surgery, the blood transfusion was administered right away.

**Discussion.**

The operation is intrusive and has built-in dangers including infection, blood clots, and difficulties from the anesthetic. It may take a long time and be difficult to recover, necessitating intensive physical treatment. A better outcome following OHR is linked to less bleeding, less soft tissue injury, and less inflammation. The promotion of minimally invasive surgery frequently uses the aforementioned criteria. It is thought that muscular injury, in particular, is of the biggest relevance and causes a delay in functional recovery. The PL technique could be anticipated to result in more muscle injury and delayed recovery than the less invasive anterior approach if tissue damage was only produced by cutting tissue. A smaller incision is used and no muscles are dissected during the minimally invasive procedure. However, a lot of strain needs to be used in order to have a decent vision during operation.

In the current study, we evaluated the amount of muscle injury and inflammation caused by total hip replacement using a minimally invasive method to the standard posterolateral approach. Furthermore, we questioned if straining the muscles under high tension during surgery results in muscle cell necrosis. We discovered equivalent levels of muscle injury and an inflammatory response in both groups, despite making a significantly bigger incision in the PL technique with what seemed to be greater direct muscle damage than in the MIO approach. The circulation levels of HTFABP in both groups increased significantly as a result of the surgery, according to the HTFABP data (Fig. 1). Following surgery, both groups had comparable peak levels of circulating HTFABP and total muscle tissue damage. Accordingly, it is hypothesized that the degree of muscle cell damage brought on by the considerable stress applied to the muscle tissue in the anterior MIO technique is comparable to the cell death brought on by cutting the muscle tissue in the traditional PL strategy. Both methods revealed a similar increase in plasma myoglobin levels to HTFABP. This demonstrates that several anomalous readings were not the
result of measurement mistakes, and that myoglobin is just as helpful as HTFABP in determining the degree of muscle injury at various surgical approaches to the hip as indicated in Table 1.

An important factor in determining the insult brought on by both surgery and trauma is interleukin-6 (IL-6). Both the PL group and the MIO group saw a considerable rise in IL-6 levels following surgery as a result of surgical trauma. In comparison to the anterior MIO technique, one would anticipate a larger peak and overall reactivity from the typical PL approach. However, there was no discernible difference in the degree of inflammation between the two surgery groups. In this pilot investigation, the hypothesised impact of decreased inflammation in MIO was not supported. Furthermore, interleukin-10 (IL-10) was used to test the anti-inflammatory response and neither group had an increase. The surgical trauma in the OHR does not appear to be significant enough to cause a tissue-protective anti-inflammatory response.

Conclusion.

Apart from the aesthetically reduced wound, little is currently no evidence to support faster healing or improved results with minimal hip methods. The minimally invasive anterior method appears to cause less muscle injury and inflammation than the traditional posterolateral technique. From our perspective, all clinicians that practice safe hip replacement are urged to gather information to show potential scientific evidence of the method’s effectiveness and lack therein.

REFERENCES


