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Our experience in Harding and «Bikini» approaches at total hip arthroplasty

A. Yu. Fil [1], M. I. Valihursky [2], O. V. Dudar [2]

[1] Volyn Regional Hospital, Lutsk. Ukraine
[2] Danylo Halytsky National Medical University in Lviv. Ukraine

Total hip arthroplasty is widely spread in all over the world medical practice. Different approaches are used for that procedure. Objective. To analyze the advantages and disadvantages of` «Bikini» approach and compare them to the Harding approach in patients after total hip arthroplasty. Methods. The results of treatment of 108 patients were retrospectively analyzed: 41 patients were operated with «Bikini» approach, 67 — with Harding approach. Total hip implant with ceramic-on-ceramic, ultra-high molecular weight polyethylene-on-ceramic, and ultra-high molecular weight polyethylene-on-metal movement pair were used, also were used both cemented and cementless types of fixation. Results were evaluated on 14 day and 3 months after the surgery by Harris scale. Results. 14-day of follow-up the average Harris score value in patients operated with Harding approach were 74.87 points, in patients operated with «Bikini» approach — 80,55 points, on the 3rd month of follow-up period the Harris score was 78.24 and 83.9 respectively. Conclusions. Both evaluated approaches have their own advantages and disadvantages, instruments and surgeon skills requirements. Proper utilization of the «Bikini» and Harding approaches provides good functional results in early and late terms. «Bikini» approach requires a larger volume of preoperative preparation. The absence of fascia lata and periarticular muscles injury due to the «Bikini» approach usage allows reducing of narcotic analgesics prescriptions, intraoperative blood loss and duration of walking with crutches. Good cosmetical scars effects are achieved by the parallelism of skin incision relatively to Langer's lines. In the early postoperative period the better functional results were marked, early rehabilitation and mild pain syndrome allow to reduce hospital length of stay. The technical complexity of the «Bikini» approach requires operations number more than 30 per year. Key words. Total hip arthroplasty, hip joint, surgical accesses, blood loss, functional result.

Операції ендопротезування кульшового суглоба широко застосовують у вітчизняній та світовій медичній практиці. При цьому використовують різні хірургічні доступи. Мета. Проаналізувати переваги та недоліки застосування хірургічного доступу «Bikini» порівняно зі стандартним доступом Хардінга в пацієнтів після операцій тотального ендопротезування кульшового суглоба. Методи. Здійснено ретроспективний аналіз результатів лікування 108 пацієнтів: 41 прооперований доступом «Bikini», 67 — Хардінга. Використано тотальні ендопротези кульшового суглоба з керамо-керамічними, поліетилен-керамічними та поліетилен-металевими парами тертя; цементний і безцементний типи фіксацій. Результати оцінювали за шкалою Харріса до операції, на 14-ту добу та через 3 міс. після ендопротезування. Результати. На 14-ту добу за шкалою Харріса середнє значення в разі використання доступу Хардінга дорівнювало 74,87 бала, доступу «Bikini» — 80,55 бала; через 3 міс. — 78,24 та 83,90 бала відповідно. Висновки. Обидва оцінених хірургічних доступи мають певні переваги та недоліки, вимоги до інструментарію та навичок хірурга. Застосування доступів «Bikini» та Хардінга за умов належного виконання забезпечує добрі результати як в ранньому, так і пізньому післяопераційному періоді. Використання доступу «Bikini» вимагає більшого обсягу передопераційної підготовки. Відсутність травматизації широкої фасції стегна та навколосуглобових м'язів у разі застосування доступу «Bikini» дає змогу зменшити необхідність призначення пацієнтові наркотичних засобів й анальгетиків, інтраопераційну крововтрату й тривалість використання допоміжних засобів для ходьби. Косметичний ефект післяопераційного рубця досягається паралельністю розрізу відносно ліній Лангера. У ранньому післяопераційному періоді визначено кращий функціональний результат, а рання реабілітація та менш виражений больовий синдром дозволяють скоротити час перебування пацієнта в стаціонарі. Технічна складність доступу «Bikini» обумовлює постійну клінічну практику хірурга із виконання не менше ніж 30 ендопротезувань щорічно.

Key words. Total hip arthroplasty, hip joint, surgical accesses, blood loss, functional result

Introduction

The method of hip arthroplasty is fairly called surgery of the century [1], because it can significantly improve the quality of life for many patients. In recent years, there has been a tendency to increase the number of such surgeries: according to US statistics, in 2000 150,000 total hip arthroplasty (THA) was performed, in 2010 more than 300,000, as of today about 400,000 [2], with a characteristic decrease in the average age of patients [3]. The most common indications for this method of treatment are stage III–IV coxarthrosis. According to world statistics, 1 patient per 1,000 population needs such operations. In Ukraine, THA is required at the rate of 1 patient per 3,000 of population, which is 15–20 thousand operations per year. At the same time, 4.5–5 thousand operations are actually performed per year [4]. Osteoporosis is a common disease that leads to fractures of the femoral neck and subsequent hip arthroplasty, especially among women (24 % of men vs. 76 % of women). Areas with equal content of compact and spongy substance, namely the neck of the femur, are most often affected in the form of a fracture. The prevalence of this injury is 957 and 414 cases per 100,000 of population among women and men, respectively [5]. Both abnormalities require THA surgery. Increased functional, cosmetic requirements (58.9 % among all operated women) [6] to this intervention led to the development of minimally invasive techniques in hip arthroplasty.

The purpose of the study: to analyze the advantages and disadvantages of using the surgical approach «Bikini» compared to the standard approach of Hardinge in patients after total hip arthroplasty.

Material and methods

The study was conducted on the basis of the Center for Traumatology, Orthopedics and Arthroscopy of Volyn Regional Clinical Hospital for the period from 2020 to 2021. The study involved retrospective analysis of the results of treatment of 108 patients (65 women, 43 men). Of these, 41 were operated with Bikini access (36 cases of coxarthrosis, 5 cases of femoral neck fracture), 67 with Harding access (51 cases of coxarthrosis, 16 cases of femoral neck fracture). The age of patients ranged from 35 to 85 years. The patients were administered total hip endoprostheses with ceramic-ceramic, polyethylene-ceramic and polyethylene-metal friction pairs. Cement and cement-free types of fixation were used. In cement-type fixation, gentamicin-containing cement was used. All patients received a course of antibiotic prophylaxis 12 hours before and 24 hours after surgery. Postoperative wound drainage was not performed.

The materials of the article were considered at the meeting of the Committee on Bioethics at the State Institution «Professor M.I. Sytenko Institute of Abnormalities of the Spine and Joints of the National Academy of Medical Sciences of Ukraine» and received a positive assessment (Protocol No. 216 of 26.04.2021) in accordance with current international and national ethical requirements.

Results and their discussion

Surgical techniques were compared according to preoperative preparation requirements, intraoperative features and functional results.

Preoperative preparation

In the case of Bikini access, patients were checked for compliance with the requirements of the body build and the development of the muscular system (Table 1).

Evaluation was performed by examination, measurement of body mass index, taking into account the activity of patients' lifestyle. These conditions are necessary because the excessive development of subcutaneous fat leads to poor visualization of the surgical wound and excessive trauma to the soft tissues, and the presence of developed muscles will require considerable physical effort to the muscle fibers during surgery. The presence or combination of these

Table 1

Prerequisites for using Bikini and Hardinge accesses

Indicator	Access type	
	«Bikini»	Hardinge
Requirements to the patient's body build	Asthenic Normosthenic Lack of significantly developed muscle and obesity	No strict requirements
Patient's position	On the back	On the side

factors raises the question of the appropriateness of Bikini access. At the same time, our experience shows that there are no such strict requirements for the patient's body build to provide Hardinge access.

It should be emphasized that the use of an electron-optical transducer (EOT) during THA operations using Bikini access is recommended because it allows to position the components of the endoprosthesis in the greatest accordance with preoperative planning, while in the case of Hardinge access this technique is uninformative.

The patient's position on the table during THA using the Bikini access is on the back. This makes it possible to perform intraoperative measurement of the difference in the length of the limbs with maximum accuracy, as their position is closest to the physiological average. This point is especially important for young and active patients, because the difference in the length of the limbs is the most common cause of their dissatisfaction [7]. When performing such operations using the Hardinge approach, the measurement of the difference in the length of the limbs has a greater error due to the reduction of the limb.

Intraoperative features of Bikini and Hardinge approaches

Blood loss during THA surgery using the Bikini access ranged from 125 to 395 ml, whereas in Hardinge access it ranged from 163 to 541 ml (t-test 5.61; $p < 0.05$).

The required number of assistants for the convenient performance of THA operation with Bikini access is 1-2, depending on the experience of the surgeon. If THA operation with Hardinge access is performed, 3 or more assistants are required.

Visualization of the surgical wound and the technique of implantation of the pelvic and femoral components of the endoprosthesis in Bikini access are quite favorable, but we observed 1 case of dislocation of the endoprosthesis head, and 1 case of incorrect positioning of endoprosthesis components. We explain this by insufficient experience in mastering the technique. When using Hardinge access, the processing of the femoral component is more complicated, but the visualization of the pelvic component is sufficient.

The length of the skin incision for Bikini access is from 8 to 13 cm, on average 10.8 cm, for Harding access from 10 to 15 cm, on average 13.2 cm. The cosmetic characteristics of the postoperative scar are higher than in Bikini access.

The greatest risk of damage to the periarticular tissues when using the Bikini access is the lateral cutaneous nerve of the thigh between the tailor and the tensioner muscle of the broad fascia of the thigh and the muscular branches of the femoral nerve

Table 2

Comparison of intraoperative indicators in Bikini and Hardinge accesses

Intraoperative indicator	Surgical access type	
	«Bikini»	Hardinge
Learning curve	Prolonged	Average
Blood loss, ml	395	541
Number of assistants	2, possibly 1	3 and more
Treatment of a femoral component	Convenient	Convenient
Ease of processing of a femoral component	Moderately favorable	Complicated
Intersection of muscular and fascial structures	Not expected	Expected
Section length, cm	8–13	10–15
Risk of damage to structures	Lateral cutaneous nerve of the thigh, femoral nerve, ascending branch of the lateral circumflex femoral artery	Upper sciatic nerve, femoral nerve
Average duration of the operation, min	107	54
Full axial load, in hours	8–12	24–36
Duration of hospital stay, days	3–7	6–9
The need to use auxiliary walking aids, week	5–9	3–7
Cosmetic scar	+	+/–
Frequency of endoprosthesis dislocations	1	0
Proportion of incorrectly positioned implants	1	0

around the tailor muscle, as well as the ascending branch of the lateral circumflex femoral artery in the interval between the tailor and the tensioner muscle of the broad fascia of the thigh. In Hardinge access, the following structures are at risk: the upper sciatic nerve between the middle and small sciatic muscles; the muscular branches of the femoral nerve around the tailor's muscle.

The average duration of the operation in Bikini access is 107 minutes, in Hardinge access 54 minutes.

The duration of the patient's stay in the hospital after THA surgery using Bikini access ranged from 3 to 7 days, and in Hardinge access from 6 to 9 days.

After analyzing the literature and our own experience, we concluded that a prerequisite for the successful implementation of total arthroplasty using Bikini access is the annual performance of at least 30 such surgeries, then they are relatively safe [8–10].

The Harris scale was used to evaluate the functional result. The obtained data were interpreted as follows: less than 70 points — unsatisfactory, 70–80 — satisfactory, 80–90 — good, 90–100 — excellent.

Evaluations were performed before surgery, on the 14th day and in 3 months after arthroplasty. On the 14th day on the Harris scale, the mean value was 74.87 points in the patients operated using Hardinge access and 80.55 points in case of Bikini access (t-test 5.57; $p < 0.05$).

In 3 months after surgery, the mean value of the functional state of the hip joint in patients after endoprosthesis with Hardinge access was 78.24 points, and with Bikini access 83.9 (t-test 4.67; $p < 0.05$).

The time from surgery to full axial load of the limb using Hardinge method averaged 25.49 hours, Bikini method 9.19 hours ($p < 0.05$).

The duration of the use of walking aids (crutches) in Hardinge access was 6.87 weeks, in Bikini access 4.64 weeks (t-test — 3.95; $p < 0.05$).

All these intraoperative indicators of these accesses are combined in Table 2.

Conclusions

Our experience in performing total hip arthroplasty shows that each of the surgical approaches used has certain advantages and disadvantages, requirements for tools and skills of the surgeon.

Proper use of Bikini and Hardinge operational approaches provides good results in both the early and late postoperative period. At the same time, using Bikini access requires more preoperative preparation.

The absence of trauma to the broad fascia of the thigh and periarticular muscles when using Bikini access reduces the need to prescribe drugs and analgesics for the patient, reduces intraoperative blood loss and the duration of use of walking aids. The cosmetic effect of the postoperative scar is achieved by the parallelism of the incision relative to the Langer lines.

The technical complexity of Bikini access determines the constant clinical practice of the surgeon with the performance of at least 30 endoprostheses per year.

In the early postoperative period, patients report better functional outcome, and early rehabilitation and less severe pain can reduce the length of hospital stay.

Conflict of interest. The authors declare the absence of conflict of interest.

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A. Yu. Fil [1], M. I. Valihursky [2], O. V. Dudar [2]

[1] Volyn Regional Hospital, Lutsk. Ukraine
[2] Danylo Halytsky National Medical University in Lviv. Ukraine

✉ Adrian Fil, MD, Prof. in Traumatology and Orthopaedics: sensejfil@gmail.com
✉ Mykhailo Valihursky, MD: mvaligurskiy@gmail.com
✉ Olexandr Dudar, MD: office.vokl@gmail.com