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REVIEW / PRACA POGLĄDOWA

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THE ASSESSMENT OF POST-OPERATIVE REHABILITATION METHODS IN PATIENTS AFTER TOTAL KNEE REPLACEMENT IN TERMS OF THE LOWER LIMB FUNCTIONS WITH ITS PROPRIOCEPTION

OCENA METOD REHABILITACJI POOPERACYJNEJ U CHORYCH PO ENDOPROTEZOPLASTYCE STAWU KOLANOWEGO W ZAKRESIE FUNKCJI KOŃCZYNY DOLNEJ Z UWZGLĘDNIENIEM PROPRIOCEPCJI

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Summary

In advanced stages of osteoarthritis of the knee joints arthoplasty is the only effective treatment for joint replacement. However, in the postoperative phase, due to its wide area, it influences patient's health and their lower limb. It requires skilfull rehabilitation. The objective was to determine the relationship between the function of the lower limb proprioception in patients after implantation of knee replacement for osteoarthritis and type of rehabilitation treatment, used in this patients.

The material included 45 patients who underwent knee replacement in Department of Orthopedics and Traumatology Collegium Medicum in Bydgoszcz (from October 2005 year – to March 2006 year) and then patients were randomly assigned to one of three groups of 15 people with a different way of rehabilitation: I – traditional, II – aggressive and III – proprioceptive.

Improvement of lower limb function was achieved after 3 months in group 2 and 3, in group 1 only after 6 months. Improvement of proprioception already noted in the early postoperative period in group 3, and in the other groups – outright deterioration. In subsequent periods the improvement was significant only in group 3, and only after 6 months in group 2.

Studies have allowed drawing following conclusions:

1. Proprioceptive rehabilitation has advantages over the traditional model and aggressive rehabilitation in terms of improving lower limb function and deep sensory.
2. The worst results of rehabilitation treatment in the assessment of lower limb function are given by a traditional model of rehabilitation.

Streszczenie

W zaawansowanych stadiach choroby zwyrodnieniowej stawów kolanowych jedynym skutecznym leczeniem jest endoprotezoplastyka, która jednak , z uwagi na swoją rozległość obciąża w fazie pooperacyjnej ogólny stan zdrowia, jak i stan operowanej kończyny dolnej. Wymaga to więc prowadzenia umiejętnej i racjonalnej rehabilitacji. Celem badań było ustalenie związku między funkcją kończyny dolnej, w tym propriocepcji u chorych po implantacji endoprotezy stawu kolanowego z powodu choroby zwyrodnieniowej, a rodzajem leczenia usprawniającego, zastosowanego u tych chorych.

Materiał obejmował 45 chorych poddanych endoprotezoplastyce stawu kolanowego w okresie od października 2005 do marca 2006 w Klinice Ortopedii i Traumatologii Narządu Ruchu CM w Bydgoszczy UMK, a następnie przydzielonych losowo do jednej z trzech 15-osobowych grup o odmiennym sposobie rehabilitacji: I-tradycyjnym, II-agresywnym i III-proprioceptywnym. Poprawę funkcji kończyny dolnej uzyskano po 3 miesiącach w grupie II i III, w I dopiero po 6 miesiącach. Poprawę propriocepcji odnotowano już we wczesnym okresie pooperacyjnym w grupie III, zaś w pozostałych grupach wręcz pogorszenie. W kolejnych okresach obserwacji poprawa ta była istotna tylko w grupie III i dopiero po 6 miesiącach w grupie II. Przeprowadzone badania pozwoliły na wyciągnięcie

następujących wniosków:
1. Rehabilitacja proprioceptywna ma przewagę nad tradycyjnym i agresywnym modelem usprawniania chorych po endoprotezoplastyce stawu kolanowego pod względem poprawy funkcji kończyny dolnej i czucia głębokiego.
2. Najgorsze wyniki leczenia usprawniającego, w zakresie oceny funkcji kończyny dolnej i propriocepcji, daje tradycyjny model rehabilitacji

Key words: function of lower limb, knee arthroplasty, rehabilitation, proprioception.

Słowa kluczowe: function of lower limb, knee arthroplasty, rehabilitation, proprioception.

INTRODUCTION:

Osteoarthritis, recognized by WHO (World Health Organization) as a disease of civilization causing one of the most important health problems worldwide and concerns 8 million people in Poland. Until recently, it was most frequently related to changes in the hip joint. This trend is currently changing [1, 2, 3, 4, 5, 6, 7].
In the advanced stages of the disease replacement joint is the one effective treatment for joint [8]. It requires skilful rehabilitation, the types of which have evolved over the years. Each department has its own models of rehabilitation, based on the experience gained and on the fundamental principles [9,10,11,12]. There are 3 different models such as: traditional, aggressive and functional, which is a combination of the previous two. More and more often proprioceptive training is introduced [11, 13, 14].
The aim of the study was to determine the relationship between the function of the lower limb proprioception in patients after implantation of knee replacement and type of rehabilitation treatment used in these patients.

MATERIAL AND METHODS:

The study was carried out in a group of 45 people with osteoarthritis that underwent knee arthroplasty from 1st October 2005 year to 30th March 2006 year in Department of Orthopedics and Traumatology Collegium Medicum in Bydgoszcz. For all, we used the same type of knee replacement. After implantation of the prosthesis, subjects were randomly assigned to one of three groups, differing in postoperative improvement (rehabilitation groups). Characteristics are given in table I:

Group (n – the number of)	I (n=15)	II (n=15)	III (n=15)	All the patients (n=45)
Women	11	13	13	37
Men	4	2	2	8
Age (age as...)	~ 70 (53–79)	~ 64 (49–79)	~ 69 (50–78)	~ 68 (49–79)
Duration of the disease (years)	~ 7 (2–20)	~ 7 (4–13)	~ 8 (4–15)	~ 7 (2–20)
Right knee	8	10	10	28
Left knee	7	5	5	17
Bilateral disease incidence	14	11	13	38
Rehabilitation model	traditional	aggressive	proprioceptive	

Table I. *Characteristics of the groups: number of women and men, age, duration of the disease, the affected party operated on both sides of the disease*

Tabela I. *Charakterystyka grup: liczba kobiet i mężczyzn, wiek, czas trwania choroby, strona zmieniona chorobowo/ operowana, obustronne występowanie choroby, model rehabilitacji*

The study was being carried out for a period of 6 months in the following research periods:
- before joint replacement (in the week before surgery)
- 14 days after arthroplasty
- 3 months after arthroplasty
- 6 months after arthroplasty

Assessment of knee function was performed using the scale of functional capacity of the knee HSS (Hospital for Special Surgery Score) consisting of seven (7) functional categories: pain, function, range of motion, muscle strength, flexion, instability, and nuisance.
Deep sensory measurement device used constructed by: lek. med. T. Rymer and dr hab. n. med. J. Kruczyński. (Fig. 1)

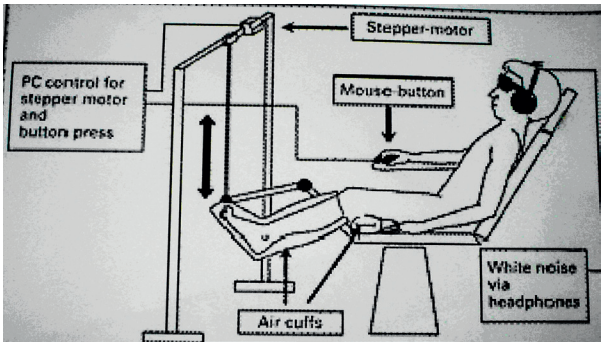

Figure 1. *A diagram of apparatus for the study of proprioception (figure borrowed from work... "Assessment of knee proprioception by typing a measuring device own design", T. Rymer, J. Kruczyński, with the consent of the authors)[19].*

Rycina 1. *Schemat budowy urządzeń do badania propriocepcji (rycina zapożyczona z pracy Ocena propriocepcji stawu kolanowego za pomocą urządzenia pomiarowego własnej konstrukcji – T. Rymer, J. Kruczyński, za zgodą autorów) [19].*

It was formed on the basis of rehabilitation seat, UPR-01B, which was produced by the SUMER Firm in Opole, in the production of medical and rehabilitation equipment. (Fig. 2)
All tests were started with the initial position of a full extension in the knee joint angle in three ranges: 0-20, 40-60 and 60-90

degrees.

Kinesthesia in terms of functionality was assessed by measuring the detection threshold of perception of passive movement curtains joint position by measuring the playback setting in motion both passive and active [1, 2, 15, 16, 17].

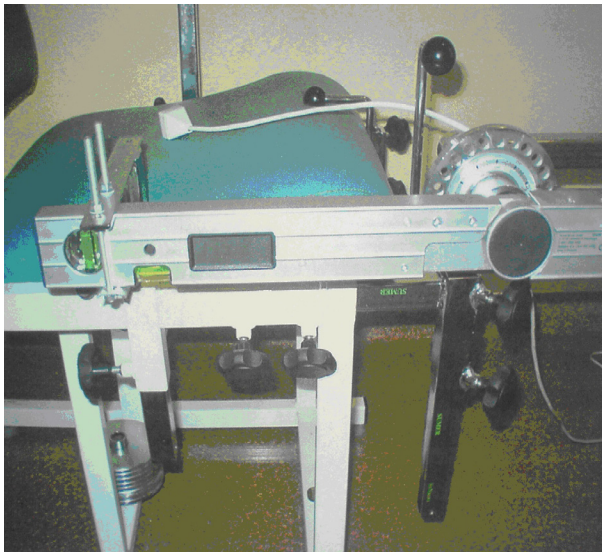

Figure 2. *Seat-mounted protractor (figure borrowed from work "Assessment of knee proprioception by measuring device own design", T. Rymer, J. Kruczyński with the consent of the authors)[19].*

Rycina 2. *Fotel z zamontowanym kątomierzem (rycina zapożyczona z pracy Ocena propriocepcji stawu kolanowego za pomocą urządzenia pomiarowego własnej konstrukcji – T. Rymer, J. Kruczyński, za zgodą autorów) [19].*

The following statistical methods were used to perform statistical analysis:

- student's t-tests (two groups)
- univariate analysis of variance (one level multi-group factor comparison)
- two-way analysis of variance with repetition according to the model

Assessing the significance of differences between the means of the subgroups was based on post-hoc tests (Scheffe) on the level $p < 0.05$ and $p < 0.01$.

RESULTS:

Improvement of lower limb function from poor to satisfactory occurred in II and III group after three months, and to good - after six months of observation. In group III in both periods higher scores were achieved.. The smallest degree of deterioration was found in III group (rehabilitation group) (figure 3). In the comparative analysis between groups on how to improve lower limb function statistically significant differences were obtained between I and III rehabilitation group. (Table II)

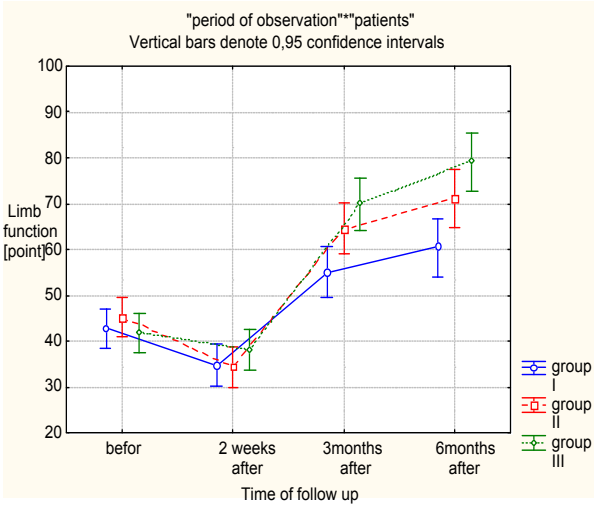

Figure 3. *Mean scores lower limb function, depending on the period of observation (before, and 2 weeks, 3 and 6 months after surgery) in each of the groups of rehabilitation.*

Rycina 3. *Średnie wartości ocen funkcji kończyny dolnej w zależności od okresu obserwacji (przed oraz 2 tygodnie, 3 i 6 miesięcy po zabiegu operacyjnym) w każdej z grup rehabilitacyjnych.*

	group	{1}	{2}	{3}
1	I		0,1732	0,0135
2	II	0,1732		0,5045
3	III	0,0135	0,5045	

Table II. *Computer level of probability (p) to assess the significance of differences between groups of limb function rehabilitation*

Tabela II. *Poziom prawdopodobieństwa (p) istotności różnic dla oceny funkcji kończyny pomiędzy grupami rehabilitacyjnymi*

In 2 weeks after total knee proprioception improvement was found in III group. The two remaining groups deteriorated to a greater extent in one group. Statistically significant differences between the mean scores of proprioception in the 3 months after surgery arthroplasty terms of mean values were found in three rehabilitation group and after 6 months of follow-up in group II and III.

In the comparative analysis between groups in the evaluation

of subsequent follow-up periods where were no statistically differences.

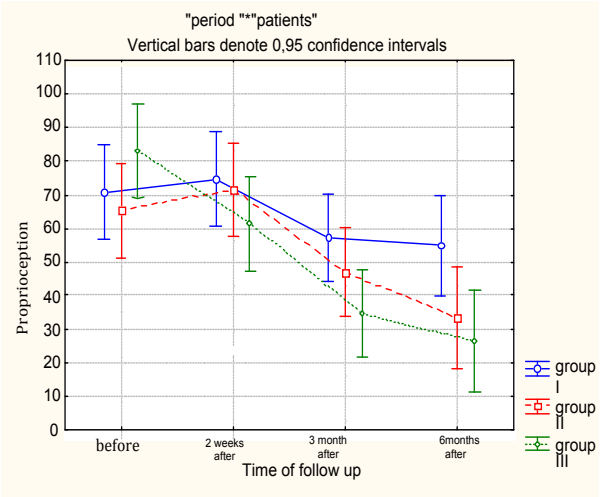

Figure 4. Mean scores lower limb function, depending on the period of observation (before, and 2 weeks, 3 and 6 months after surgery) in each of the groups of rehabilitation.

Rycina 4. Średnie wartości ocen propriocepcji w kończynie operowanej w zależności od okresu obserwacji (przed oraz 2 tygodnie, 3 i 6 miesięcy po zabiegu operacyjnym) w każdej z grup rehabilitacyjnych.

DISCUSSION:

Gonarthritis, especially in advanced stages, greatly hampers the normal functioning of the patients. It limits the sports activity, social contacts, business and home duties. The simplest daily activities, such as personal hygiene, may be difficult for these patients. Therefore, when a decision about a surgical treatment is made, patients hope for the improvement in their quality of life. [15, 18]

However, is the treatment effect predictable? What affects the final result? How can it be improved? These and many similar questions have been bothering clinicians, interesting in the problem of osteoarthritis, for many years. [7, 10, 11, 18].

Some of them emphasis an important place of psychological impact of rehabilitation in the recovering process after surgical treatment. In the study of Russell et al, conducted in Australia [19], assessing the level of patient satisfaction, the very good result was revealed in patients, who took part in an outpatient "telerehabilitation". Each patient was provided with a comprehensive instructions and daily contact with a physiotherapist through the Internet connection.

Our observations allow an assumption that the psychological aspect of treatment is very important. Patients, who were mobilized by the proprioceptive programme, which required longer and more frequent patient contact with the staff, achieved better results in terms of subjective assessment of treatment as also in the quality of life.

Knowledge of factors influencing the final outcome of knee arthroplasty in patients with osteoarthritis, especially determine the best way of the postoperative rehabilitation, can be used in the treatment planning and can help to increase its effectiveness.

CONCLUSIONS:

1. Proprioceptive rehabilitation has advantages over traditional and aggressive on improving patients after knee replacement in terms of improving lower limb function gives the traditional model of rehabilitation.
2. The worst results were given by a traditional model of rehabilitation.

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