Patellar Resurfacing Compared with No Resurfacing in Total Knee Arthroplasty

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Abstract

Background: This is a prospective comparative study to evaluate the functional outcomes in Patellar Resurfacing Compared with non Resurfacing in Total Knee Arthroplasty.

Aim of Study: The aim of this study was to compare clinical and radiographic outcomes of TKA with and without patellar resurfacing using a patella-friendly prosthetic design. This study was focused on clinical outcomes and complications related to the patellofemoral joint. Two groups in the first half of the study, the patella was resurfaced in all patients, while it was retained in all patients in the second half of the study. The selection nature was not based on age, comorbidities, patella morphology, obesity, or pre-operative radiographs.

Patients and Methods: In the period between December 2015 and September 2017, a prospective RCT was conducted involving 40 patients having knee osteoarthritis (20 cases had Resurfacing Patella and 20 cases had non Resurfacing Patella). These patients were 20 males (50%) and 20 females (50%). The post-operative follow up of these cases was 1 year.

Results: We identified 40 eligible TKRs, including 20 RP. Compared to 20 No R P. The knee society scoring system used for pre- and post-operative assessment. The mean pre-operative knee score in R P knee was 39 and the mean pre-operative functional score was 56.25 while in No RP knee group the mean pre-operative knee score was 38 and the mean pre-operative functional score was 55.75. In R P knee group the mean post-operative knee score was 94.70 which is considered excellent result. And the mean post-operative functional score was 76 which are considered good result while in No RP knee group the mean post-operative knee society score was 98.90 which is considered excellent result and the post-operative functional score was 74.75 which also considered good results.

Conclusion: We founded that there was no significant difference between both groups with post-operative improvement in all cases.

Key Words: Osteoarthritis – Resurfacing Patella – Non Resurfacing Patella – Arthroplasty knee – Functional outcomes.

Introduction

TOTAL knee arthroplasty (TKA) is an effective surgery for patients with end-stage refractory knee osteoarthritis. It is associated with significant improvement in pain, function and quality of life [1,2]. The most common underlying diagnoses for primary TKA are osteoarthritis [3,4]. Most literature to date has focused on surgical and implant factors affecting implant outcomes (such as the risk of revision) after TKA, and in a systematic review of 40 studies, revision, infection rates after total joint arthroplasty were lower in OA [5]. There is an emerging literature related to factors associated with patient-reported outcomes (PROs) (pain, function, quality of life) after TKA [6-9]. However, fewer studies have assessed the association of underlying diagnosis with PROs after TKA.

Material and Methods

In the period between December 2015 and September 2017, a prospective RCT was conducted involving 40 patients having knee osteoarthritis (20 cases had Resurfacing Patella and 20 cases had non Resurfacing Patella). These patients were 20 males (50%) and 20 females (50%). The post-operative follow up of these cases was 1 year.

The Patient Demographics study group included 40 patients; Ages ranged from 45 years to 75 years with mean age 56.10 (SD ± 11.62) years. Weight ranged from 67Kg to 110Kg with mean 79.42 (SD ± 10.35) Kg. Height ranged from 159 cm to 180cm with mean cm 168.75 (SD ± 4.66) cm. BMI ranged from 23 to 38.90 with mean 28.16 (SD ± 3.87).

23 patients had TKA on the right side and 17 patients on the left side.

All patients were followed at 2 months, 6 months, 1 year postoperatively. A joint replacement
database was used to examine Knee Society scores (KSS) [10], knee function scores, knee alignment, and range of motion both preoperatively and post-operatively. Failure rates were also examined. Statistics were performed using SPSS (Statistical Package for Scientific Studies).

**Results**

Results of this study were assessed in the guidance of the Knee Society Scoring System. The results are described as found at the last follow-up which ranged for 1 year.

The knee society scoring system used for pre- and post-operative assessment. The mean pre-operative knee score in RP knee was 39 and the mean pre-operative functional score was 56.25 while in No RP knee group the mean pre-operative knee score was 38.6 and the mean pre-operative functional score was 55.75. In RP knee group the mean post-operative knee score was 94.70 which is considered excellent result. And the mean post-operative functional score was 76 which are considered good result while in No RP knee group the mean post-operative knee society score was 98.90 which is considered excellent result and the post-operative functional score was 74.75 which also considered good results.

There was statistically significant increase in preoperative mean scores of Ant. post. stability, Med. Lat. stability, ROM, Stairs. pain KSS, Ext.lag, F. deduction, Stairs FS and Walking FS in group RP in comparison to group No RP ($p<0.05$). (Fig. 1).

There was statistically insignificant increase of mean preoperative scores of Walk. Pain KSS, Flexion. cont., Malalignment and Pain at rest in group RP in comparison to group No RP ($p>0.05$).

There was statistically insignificant difference of mean postoperative KSS scores between group RP & No RP ($p>0.05$), except Walk pain KSS score in which there is increase in mean postoperative score of group No RP in comparison to group RP ($p<0.05$). (Fig. 2).

These results indicate no significant difference between both groups with post-operative improvement in all cases.

<table>
<thead>
<tr>
<th>Preop. mean Knee score</th>
<th>Group</th>
<th>Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ant. post. stability</td>
<td>9.20</td>
<td>8.45</td>
<td>0.004</td>
</tr>
<tr>
<td>Med. lat. stability</td>
<td>11.75</td>
<td>10.25</td>
<td>0.040</td>
</tr>
<tr>
<td>ROM</td>
<td>19.15</td>
<td>18.60</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Stairs. pain KSS</td>
<td>5</td>
<td>4.45</td>
<td>0.044</td>
</tr>
<tr>
<td>Walk. pain KSS</td>
<td>10.50</td>
<td>10</td>
<td>0.061</td>
</tr>
<tr>
<td>Ext. lag</td>
<td>-2.40</td>
<td>-2</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>F. deduction</td>
<td>5.25</td>
<td>-5</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Flexion. cont.</td>
<td>-3.35</td>
<td>-3</td>
<td>0.419</td>
</tr>
<tr>
<td>Malalignment</td>
<td>-1.35</td>
<td>-1.25</td>
<td>0.173</td>
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<tr>
<td>Pain at rest</td>
<td>-4.25</td>
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<td>0.664</td>
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<tr>
<td>Stairs FS</td>
<td>32</td>
<td>31</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Walking FS</td>
<td>30</td>
<td>29.25</td>
<td>$&lt;0.001$</td>
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<table>
<thead>
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<th>Postop. mean Knee score</th>
<th>Group</th>
<th>Group</th>
<th>p-value</th>
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<td>Ant. post. stability</td>
<td>9.80</td>
<td>9.90</td>
<td>0.560</td>
</tr>
<tr>
<td>Med. lat. stability</td>
<td>14.75</td>
<td>15.0</td>
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</tr>
<tr>
<td>ROM</td>
<td>25</td>
<td>25</td>
<td>0.324</td>
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<tr>
<td>Stairs. pain KSS</td>
<td>13.75</td>
<td>14.25</td>
<td>0.442</td>
</tr>
<tr>
<td>Walk. pain KSS</td>
<td>33</td>
<td>34.75</td>
<td>0.007</td>
</tr>
<tr>
<td>Ext. lag</td>
<td>0</td>
<td>0.50</td>
<td>0.324</td>
</tr>
<tr>
<td>F. deduction</td>
<td>-4</td>
<td>-3</td>
<td>0.225</td>
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<tr>
<td>Flexion. cont.</td>
<td>0</td>
<td>0</td>
<td>0.336</td>
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<tr>
<td>Malalignment</td>
<td>-0.10</td>
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<td>0.336</td>
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<td>Pain at rest</td>
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<td>Stairs FS</td>
<td>40</td>
<td>38</td>
<td>0.095</td>
</tr>
<tr>
<td>Walking FS</td>
<td>40.50</td>
<td>38.50</td>
<td>0.105</td>
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Table (1): Comparison of other knee scores preoperatively between two groups of the study (n=40).

Table (2): Comparison of other knee scores postoperatively between two groups of the study (n=40).
Case presentation:

Case RP:

Knee Society Scoring (KSS): Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
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<tbody>
<tr>
<td>1- Pain:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Walking</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>B- Stairs</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>2- ROM:</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>3- Stability:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Med/Lat</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>B- Ant/Post</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>4- Deduction:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Ext. lag</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td>B- Flex. cont</td>
<td>-4</td>
<td>0</td>
</tr>
<tr>
<td>5- Mal-alignment:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6- Pain at rest:</td>
<td>-15</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100</td>
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</tbody>
</table>
Fig. (3-B): Post-operative X-ray AP & Lateral view left side.

Fig. (3-C): Three month post-operative X-ray AP & lat view.

Fig. (3-D): Six month post-operative X-ray lat & AP view.

Knee Society Scoring (KSS): Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Pain:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Walking</td>
<td>5</td>
<td>30</td>
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<tr>
<td>B- Stairs</td>
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<td>15</td>
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<tr>
<td>2- ROM:</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>3- Stability:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Med/Lat</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>B- Ant/Post</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>4- Deduction:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Ext. lag</td>
<td>–10</td>
<td>0</td>
</tr>
<tr>
<td>B- Flex. cont</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5- Mal-alignment:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6- Pain at rest:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
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</table>

Functional score:

<table>
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<tr>
<th>Item</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Walking</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>2- Stairs</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>3- Functional deductions</td>
<td>–20</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>85</td>
</tr>
</tbody>
</table>

Fig. (4-A): Pre-operative X-ray AP & Lateral view.

Fig. (4-B): One month post-operative X-ray AP and Lateral view.
Fig. (4-C): Two months post-operative X-ray AP and Lateral view.

Fig. (4-D): Three months post-operative X-ray AP and Lateral & view.

Fig. (4-E): Six months post-operative X-ray AP and Lateral view.
Discussion

In this study, we compared patients receiving TKA based on RP versus No RP.

In our cohort, we used TKA with a FB design which has yielded a good long-term result [11].

The most important finding of this study was that there is no statistically significant difference postoperative in KSS scores between group RP & No RP at 1 year follow-up. Our study documented also gratifying results of TKA.

We focused on good cementing technique, correct flexion and extension gaps balancing, correct deformity and well-balanced ligaments to achieve a high success rate.

The KSS changed in post-operative compared to pre-operative KSS. The mean pre-operative knee score in RP knee was 39 and the mean pre-operative functional score was 56.25 while in No RP knee group the mean pre-operative knee score was 38.6 and the mean pre-operative functional score was 55.75. In RP knee group the mean post-operative knee score was 94.70 which is considered excellent result and the mean post-operative functional score was 74.75 which also considered good results.

Our results are actually consistent with results reported in previous research. In short-term follow up was reported greater improvements in pain and function in RP patients compared to No RP patients.

Overall moderate-severe ADL limitation was less frequent in RP versus No RP patients at 1st year (100).

On the other hand, we found no significant differences in pain KSS scores except Walk pain KSS score in which there is increase in mean postoperative score of group No RP in comparison to group RP.

These findings add to the current literature, which consists of mostly small studies and somewhat contradictory findings.

Kirwan et al., [18] studied 293 patients at 2.5 years had 335 operations (RP, knee 76; No RP, knee 54). A few patients showed deterioration in pain and function 1 year after surgery, but the remainder showed improvements which took 1 year or more to reach maximum and were maintained for at least 3 year. Reported greater improvements in pain and function in RP patients compared to No RP patients.

Judge et al., [13] studied 1991 patients receiving primary TKR in south-west London from 2005 to 2008. The primary outcome is the 6-month post-operative Oxford Knee Score (OKS). To classify whether patients had a clinically important outcome, he calculated a patient acceptable symptom state (PASS) for the 6-month OKS related to satisfaction with surgery. The strongest determinants of outcome include pre-operative pain/function those with less severe pre-operative disease obtain the best outcomes; diagnosis in relation to pain outcome-patients with No RP did better than those with RP. Deprivation those living in poorer areas.

Had worse outcome and pre-operative anxiety/depression led to worse pain. Differences were observed between predictors of pain and functional outcomes. But in our study we found that there is no difference in pain and functional outcomes in RP versus No RP.

Jasvinder et al., [14] for the 2-year cohort, the mean age was 68 years, 56% were women, and 18% were ages <60 years. BMI was >30kg/m² in 52% of patients and ASA score was class III/IV in 42%. The 5-year cohort had similar characteristics. The survey response rates were 65% (7,139 of 10,957 TKAs) at 2 years and 57% (4,234 of 7,404 TKAs) at the 5-year follow-up. He found that patients with RP who underwent primary TKA had better ADL outcomes compared to patients with No RP at 2 and 5 years. On the other hand, the pain outcomes after primary TKA did not differ in RP versus No RP. But in our study we found that there is no difference in functional and ADL outcomes in RP versus No RP.

Kennedy et al., [15] studied 2,032 patients over 3 decades from 1974 that had a 40% response rate, better composite pain and function outcome in RP versus No RP at 5 years post- TKA was shown.

Merrill et al. [16] studied 207 patients eligible TKR, including 161 RP compared to 96 No RP. In theResurfacing group, the average KSS changed from 48.7 preoperatively to 92.2 postoperatively. The Resurfacing group knee function scores improved from 43.6 to 83.0. The knee range of motion increased from 105.5° to 111.4° and the alignment changed from .3° of varus to 3.9° of valgus. In the non Resurfacing group, the KSS average improved from 57.2 preoperatively to 87.2 postoperatively. The knee function scores changed from 39.3 to
77.2. The range of motion increased from 93.1° to 103.2° and alignment changed from 7.4° of valgus to 5.4° of valgus. Founding there were some minor variations in the outcome of (Resurfacing vs. non Resurfacing).

But in our study in the Resurfacing group, the average KSS changed from 39 preoperatively to 94.7 postoperatively. The Resurfacing group knee function scores improved from 56.25 to 76. The knee range of motion change from 19.15 ± 2.64 to 25 and the alignment changed from −1.35 ± 1.46 to −0.10 ± 0.44. In the non Resurfacing group, the KSS average improved from 18.6 preoperatively to 98.9 postoperatively. The knee function scores changed from 16.75 to 74.75. The knee range of motion change from 12.60 ± 3.03 to 25 and the alignment changed from −2.75 ± 4.26 to 0. Founding that there is no difference in pain and functional outcome in RP versus No RP.

Susan M. et al., [17] studied 4,456 eligible TKRs, including 136 No RP.

<table>
<thead>
<tr>
<th>Our study</th>
<th>Merril et al. [99]</th>
<th>Jasvinder et al. [100]</th>
<th>Judge et al. [96]</th>
<th>Susan M. et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>40 Patients (20 RP&amp;20 No RP)</td>
<td>207 Patients (161 RP&amp;46 No RP)</td>
<td>7,139 patients</td>
<td>1991 patients</td>
</tr>
<tr>
<td>Type of study</td>
<td>RCT</td>
<td>RCT</td>
<td>RCT</td>
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<td>Outcome parameters</td>
<td>KSS</td>
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<td>OR, CI</td>
<td>OKS</td>
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<td>1 years</td>
<td>2 years</td>
<td>2 years</td>
<td>6 months</td>
</tr>
<tr>
<td>KSS Knee score RP</td>
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<td>92.2</td>
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<tr>
<td>KSS Knee score No RP</td>
<td>98.9</td>
<td>87.2</td>
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<tr>
<td>KSS Function score RP</td>
<td>76</td>
<td>83</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>KSS Function score No RP</td>
<td>74.75</td>
<td>77.2</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Odds ratios OR</td>
<td>–</td>
<td>–</td>
<td>ADL Pain</td>
<td>RP: 21.7% 7.1</td>
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<tr>
<td>95% Confidence interval CI</td>
<td>–</td>
<td>–</td>
<td>RP: 0.5 0.8</td>
<td>No 1</td>
</tr>
<tr>
<td>Oxford Knee Score OSK</td>
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<td>–</td>
<td>–</td>
<td>Pain Function</td>
</tr>
<tr>
<td>WOMAC</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No 1.68 1.23</td>
</tr>
<tr>
<td>Result</td>
<td>No statistical difference</td>
<td>Some minor difference</td>
<td>No statistical difference</td>
<td>Observe some difference</td>
</tr>
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</table>

During 2 year follow-up data was available on 94.7% of patients. For RP patients, there were minimal differences between those who completed the 2 year follow-up survey (n=4220) and those who did not (n=236). And for No RP, 108 (79%) of patients had 2-year data. There was no significant difference between patients who responded to the 2-year questionnaire and those who did not for age (63.0 vs. 65.4; p-value=0.24), BMI (28.4 vs. 29.0; p-value=0.75), gender (female 90% vs. 93%; p-value=1.00), or race (Caucasian 74% vs. 79%; p-value=0.62). However, those without 2 year data had less educational achievement. 96% of those without 2 year data had no college education compared to 56% of those with 2 year data (p-value <0.0001). In No RP cases WOMAC Baseline Pain 55.9 vs. WOMAC 2-year Pain 13.3 and WOMAC Baseline Function 58.7 vs. WOMAC 2-year Function 17.4. In cases RP WOMAC Baseline Pain 46.6 vs. WOMAC 2-year Pain 12.7 and WOMAC Base-
line Function 47.3 vs. WOMAC 2-year Function 14.7. He included all patients with No RP regardless of 2-year data, in order to maximize the size of the No RP cohort. Founded that No RP patients undergoing primary TKR have excellent 2-year outcomes, comparable to RP, in spite of worse preoperative pain and function. In this contemporary cohort, No RP is not an independent risk factor for poor outcomes.

The results highlight a number of important issues in relation to the effectiveness of TKR. Previous quantitative work suggests that TKRs relieve pain and improve mobility, with a 'good' or 'excellent' outcome in approximately 90% of patients [18].

The table below compares between this study and another study that is similar in design and functional assessment tools. We were not able to identify any difference between this study and other similar studies.

The main strength of our study is the fact that we examined outcomes using knee society scoring systems, which represent the most widely, used scoring systems for assessment of knee function following TKA. The used scoring systems include both patient filled and clinician filled questionnaires. The used common outcome measures aimed to report data in a standardized way to enable inclusion of the data in future meta-analyses.

The main limitation was the short follow-up duration. However, the main interests of the study were pain, active flexion and extension, alignment, stability and functional outcomes, which is clinically relevant within the first year postoperatively. It has been shown by Heck et al. (101) that most improvement in knee function following TKA occurs in the first year. Accordingly we believe that our study reliably compared these functional outcomes.

Long term outcome is also important. It was thought at the end of this study that long term analysis would lead to more valid conclusions.

Conclusion:

In this study, we tried to compare between the functional outcomes in Resurfacing compared to non Resurfacing after primary total knee arthroplasty, especially pain relief, stability, well aligned knee and restore range of motion, and improved function especially patient who can walk an unlimited distance and go up and down stairs normally which actually reveal no significant difference between both groups while implant durability study need long term follow-up.

References


المقارنة بين سطح الرضة وعدم تسطيحها

في حالات استبدال مفصل الركبة بمفصل صناعي كامل

أجريت هذه الدراسة على 40 مفصل ركبة في 20 مريض مصاب بالتهاب مفصل الركبة مع المرض الروماتويدي، وكان الهدف هو دراسة تأثير تغيير مفصل الركبة الكامل في هذه الحالات على تغيير سطح الرضة في 20 ركبة (المجموعة الأولى) في مرضى الرئة الركبية (المجموعة الثانية) من حيث تخفيف الألم وتحسين وظيفة الركبة.

تم قسم المرضى إلى مجموعتين، حيث تم استخدام طريقة علاج مفصل الرضة في المجموعة الأولى (م)، ومقارنة الشكل في المجموعة الأولى (م،) حيث علوج سطح الرضة بجراثيم الالتهاب الوراثية النشطة والأنسجة الضوئية المتبقية وتتطلب سطح الرضة في الأماكن التي لا تتطابق نسخة مرضية مع إضافة سطح الرضة صناعية.

في المجموعة الأولى كانت 10 ركبة في 20 مريض موجودون في هذه المجموعة.

- في المجموعة الثانية كانت 20 ركبة في 20 مريض موجودون في هذه المجموعة.

في هذه الدراسة كانت نسبة النساء إلى الرجال 2:1 في المجموعة الأولى. وفي المجموعة الثانية كانت نسبة: 1:1. تجاوزت عمر المرضى الذين علوجوا في المجموعة الأولى ما بين 10 إلى 70 عامًا (متوسط العمر 50 عامًا) وفي المجموعة الثانية تراوحت أعمارهم ما بين 60 إلى 72 عامًا (متوسط العمر 60 عامًا).

كان المرضى الذين علوجوا في المجموعة الأولى (م) والمرضى في المجموعة الثانية (م) تراوحت أعماقهم ما بين 50 إلى 100 مليمتر (متوسط الوراثة 82 مليمتر). وفي المجموعة الثانية (م) تراوحت أعماقهم ما بين 30 إلى 60 مليمتر (متوسط الوراثة 43 مليمتر).

اشتلت المجموعة الأولى على 10 ركبة بميمى و3 ركبة بسرى، واشتلت المجموعة الثانية على 11 ركبة بميمى و9 ركبة بسرى.

تم تقديم كل الحالات تغيير كامل لمفصل الركبة في الفترة ما بين يوليو 2014 حتى أبريل 2018. وذلك بتطبيق مفصل الركبة الثابت.

تم تغيير سطح الرضة في كل حالات المجموعة الأولى (م) (20 ركبة) وعمد تغيير في كل حالات المجموعة الثانية (م) بعد إجراء عملية تعويلية لسطح الرضة وثبت هذه العملية إظهار الرئة في الوراثة المرضية النشطة وإجراء تقويم بسطح الرضة في الأماكن التي لا تتطابق نسخة مرضية.

أتت النتائج (18%) في المجموعة الأولى (م) ونسبة (0%) في المجموعة الثانية، حيث حددت رقة عظمية لأعلى عظام القسم من الناحية الرئيسية.

أثناء الجراحة وقد تم تنفيذ هذه الرقة عظمية مع العظام المحيطة بها أثناء المباراة باللمسة بالأشعة.

تتراوح وقت إجراء الجراحة في المجموعة الأولى بين 100 إلى 115 دقيقة (متوسط زمن الجراحة 127 دقيقة) وفي المجموعة الثانية تراوح الوقت من 90 إلى 115 دقيقة (متوسط زمن الجراحة 108 دقيقة).

تم تحميل نتائج الحالات على وحدة الحركة بواسطة نظام التقييم الإلكتروني وتم قياسها ب...',...

وبعد الجراحة تحسن إلى 35.89 نقطة (المعدل: من 12 إلى 30 نقطة).

وفي المجموعة الثانية كان متوسط تقييم الحالات قبل إجراء الجراحة 68.57 نقطة. بعد الجراحة تحسن 114.60 نقطة (المعدل: من 71 إلى 114 نقطة). وكان التقييم الديلي قبل إجراء الجراحة 11.71 نقطة (المعدل: من 2 إلى 18 نقطة). وبعد الجراحة تحسن إلى 76.52 نقطة (المعدل: من 18 إلى 30 نقطة).

ولم يجد فرقاً مهماً من الناحية الإحصائية فيما يخص التقييم الإكلينيكي والرضيي بعد الجراحة بين المجموعات الأولى والثانية (حيث كان معدل الإحتمال 0.48 و 0.47 بالترتيب).

وكان التحسن في تخفيف الألم كبيراً حيث كان متوسط تقييم الألم الراكي في المجموعة الأولى قد تحسن من 4.76 نقطة (المعدل: من 2 إلى 10 نقطة) قبل الجراحة إلى 4.67 نقطة (المعدل: من 2 إلى 10 نقطة) بعد الجراحة. وفي المجموعة الثانية تحسن من 4.76 نقطة (المعدل: من 2 إلى 10 نقطة) قبل الجراحة إلى 4.99 نقطة (المعدل: من 2 إلى 10 نقطة) بعد الجراحة. وقد ساعد تحسين الألم إلى تحسن وظيفة الركبة وúaورة المريض على أداء واجباته اليومية بصورة جيدة.

كان التقييم الكلي في المجموعة الأولى مرضى في 17 مفصل ركبة (85%) وغير مرضى في 3 مفاصل (15%) وفي المجموعة الثانية كان التقييم الكلي مرضى في 18 مفصل ركبة (90%) وغير مرضى في 2 مفاصل (10%).

وقد وجد أن تحسن الألم، استقلال الركبة، تحسن حركة مفصل الركبة. آلية الركبة، المساحة التي يستطيع المريض أن يسيرها، المقدرة على صعود وهبوط السلم وركوب الدراجة. وبناء الكتلة العضدية. وألم أمام الركبة. كلها قد تحسن في كلا المجموعتين.

وفي هذه الدراسة لم نجد فرق مهم بين أي من المجموعتين على الأخرى فيما يخص كل هذه النقاط.

أيضاً من هذه الدراسة وجد أن سبب حدوث المرض ووجود 1 بي بعد مقدمة الركبة قبل الجراحة ودرجة تناقل السطح الغضروف. للرضفة والكبسlica في الأربطة الخارجية لل alumnoة الركبة وتحديد ميل خارجي لتعلم الرضة أثناء حركة مفصل الركبة بعد الجراحة وتغير السطح الغضروف لتعلم الرضة أو عدم تغيرها يمكن اعتبارها مؤشراً أو بنتيجة لعدة أسباب أمم الركبة. بينما علل نظام الرضة، ومجفرين نفق عظمي الفخذ بعد الجراحة.

وقد حددت مضاعفات لها علاقة بعملية تغيير مفصل الركبة في حالتين (10%) في المجموعة الأولى وفي 5 حالات (25%) في المجموعة الثانية. وشملت هذه مضاعفات رشح من مكان الشق الجراحي للجذع أمام الركبة. مشاكل في الثاق شق الجراحي، جلطة بالأوردة الداخلية للракبة.