Thromboembolic risk after knee endoprosthesis


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Abstract. – Thromboembolic complications are the most frequent associated pathologies after knee replacement. The secondary deep vein thrombosis in the knee arthroplasty is often low symptomatic or asymptomatic and, sometime, it could lead to fatal pulmonary embolism. This is the main purpose recommending an antithrombotic prophylaxis. In this study 214 patients operated for knee arthroplasty and receiving low molecular heparin therapy were enrolled. They were clinically and echo/radiologically monitored for thromboembolic and/or hemorrhagic complications on the 2nd, 7th, 14th and 45th day from surgery. Results showed that only 45% of the cases developed DVT (deep vein thrombosis) out of which 17% could be objectively verified by ultrasonography and phlebography. In only one case massive pulmonary embolism with fatal evolution was discovered. It was not found any major bleeding except in four cases in which local haematomas were discovered (most probably related to anticoagulant treatment). This study concluded that the administration of low molecular weight heparin after knee arthroplasty significantly reduces the risks of thromboembolism in conditions where the increase of hemorrhagic complications doesn’t result statistically significant.

Key Words: Arthroplasty, Thromboembolism, Low Molecular Weight Eparin (LMWH), Deep venous thrombosis.

Introduction

Thromboembolism after knee endoprosthesis is a possible well known complication. Some studies evidenced a 40-80% of Deep Venous Thrombosis (DVT) cases where it wasn’t administered any antithrombotic prophylaxis1-5. In this situation, a 23% of possibilities could lead into a proximal thrombosis6,7 with a 2-5% risk of a pulmonary embolism2,4. An associated antithrombotic prophylaxis could reduce this percentage to 1-2%5-7. Some associated factors, such as the bilateral endoprosthesis, could significantly increase this risk8. In the same way cigarette smoking, with/or associated pathologies like hydrostatic varicosity, ischemic cardiopathy and atrial fibrillation, could also increase the thrombotic risks8-11. In order to decrease this risk, warfarin or acetylsalicylic acid is strongly recommended as prophylactic method on a large scale together with plantar air pump or calf pumps12. In some cases, only acetylsalicylic acid administration is recommended12,13. In Europe the most frequent prophylaxis method used is the subcutaneous administration of low molecular weight heparin. Although this method is expensive, the results shown by the literature are very encouraging16,17. Ongoing studies are trying to well define type, duration and dosage of Low Molecular Weight Heparin (LMWH) to be safely used in endoprosthesis surgery. Scope of this study is to show the statistical results obtained pre-treating the enrolled endoprosthetic knee patients with low molecular weight heparin.

Materials and Methods

214 patients admitted in Timisoara Orthopedic Clinic were enrolled in this study. They went under surgery for total knee prosthesis in the period January 2002-January 2006. In this group were included all those patients who were operated with this method and receiving enoxaparins. It is a low molecular weight heparin used to prevent and treat deep vein thrombosis or pulmonary embolism, and is given as a subcutaneous injection (by a health care provider or the patient). Enoxa-
parin is approved for the prophylaxis of thromboembolic disorders of venous origin, in particular those which may be associated with orthopaedic surgery, for treatment of venous thromboembolism in bedridden patients suffering acute illness, for treatment of venous thromboembolism disease presenting deep vein thrombosis, pulmonary embolism or both and, finally, to treat the unstable angina and non-Q-wave myocardial infarction, concurrently administered with aspirin. It could be also used in the prevention of thrombus formation in the extracorporeal circulation during haemodialysis. Our study enrolled 245 patients clinically admitted for knee endoprosthesis (31 bilateral but in different operative timing) in which 142 females (66%) and 103 males patients (34%). From the age point of view, the distribution was relatively homogenous in both sexes (Table I) in which endoprosthesis are most frequently implanted in patients aged 60-70 yrs.

Associated pathologies, anticoagulant treatments, adverse reactions and complications were, in any case, monitored and collected.

Further, the Following Aspects Were Investigated and Collected:

- Previous thromboembolism
- Previous treatment with anticoagulants
- Period of post-operative anticoagulant therapy
- Post operative wound drainage
- Necessity of blood transfusion
- Thromboembolic complications
- Haemorrhagic complications
- Other complications related to anticoagulant treatment

In our study all patients received, after surgery, antithrombotic medication with subcutaneous injection of low molecular weight heparin for a period of 21 days (enoxaparin 0.4-0.8 ml related with the weight of the patient). Only those patients who had previous cases of thromboembolism and/or who received preoperative anticoagulant treatment by cause of some associated pathology, didn’t stop the anticoagulant treatment but a dose settlement in relationship with the type of antithrombotic drug. The post-operative follow-up period lasted 6 weeks. Due to different reasons, in this study 43 patients (20%) didn’t finished the follow up period. In the final part of the follow up period 2 patients were excluded from the study because of lethal complications.

Below Are Listed Some Pathologies Suffered by Patients Enrolled in this Study:

- Ischemic cardiopathy – 49 patients
- HTA – 84 cases
- Vascular cerebral accident – 21 patients
- Atrial fibrillation – 29 patients
- Deep vein thrombosis in antecedence – 12 patients
- Valvular prosthesis – 4 cases
- Arterial prosthesis – 2 cases
- Hydrostatic varicosities – 43 cases
- Obesity – 69 cases
- Smokers – 24 cases

All the interventions were done under spinal subarachnoidian or peridural anesthesia. It is well known that, in case of hip endoprosthesis, this kind of anaesthesia reduces the thromboembolic risks but, in knee endoprosthesis, this advantage is reduced because of the use of tourniquet. The mean duration of intervention was 55 minutes (from 45 to 80 min). The wound drainage was postoperatively kept along 24-48 hrs. All patients received antibiotic prophylaxis. Our observations revealed that 1% of the patients with associated pathologies had an increased risk of thromboembolic event. For this reason the antithrombotic therapy was carefully observed in our study.

After Surgery the Following Factors Were Taken in Account for the Follow Up:

- Clinic
- Postoperative hemorrhage
- Hemoglobin and hematocrit
- Appearance of hematoma at the level of wound
- Appearance of pulmonary embolism (major/ minor)
- Other signs which can be caused by the antithrombotic treatment

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 55</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>8</td>
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<tr>
<td>55-60</td>
<td>19</td>
<td>9</td>
<td>28</td>
<td>14</td>
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<tr>
<td>61-65</td>
<td>33</td>
<td>22</td>
<td>55</td>
<td>25</td>
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<tr>
<td>66-70</td>
<td>43</td>
<td>29</td>
<td>72</td>
<td>33</td>
</tr>
<tr>
<td>Over 71</td>
<td>30</td>
<td>12</td>
<td>42</td>
<td>20</td>
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Ultrasonography was performed in those cases where DVT was suspected. A “bilateral ascending venography” was performed in those cases where it was necessary a radiologic support for a deep venous prophylaxis). Likewise, in patients displaying bleeding or haematoma, blood samples were taken in order to define bleeding and coagulation times. All patients not showing any complication were anyway evaluated on the 2nd, 7th, 14th and 45th day after surgery. On day 2 after surgery, bleeding in the drainage, local haematomas and signs of DVT were evaluated. On day 7 and 14 after surgery, all patients were evaluated for DVT presence by echography and/or venography while, on the 45th day after surgery, a final clinical and radiological check-up was performed.

Assessment of Efficacy and Safety

Bilateral ascending venography was performed at 9 ± 2 (mean ± SD) day after surgery or earlier, if there were clinical signs of deep-vein thrombosis. The criterion for the diagnosis of deep-vein thrombosis was the presence of a constant intraluminal filling defect (2 patients). Patients who showed both proximal and distal thrombosis were classified only as proximal thrombosis. All venograms were evaluated by the same radiologist. Objective measures of bleeding included intraoperative blood loss (as estimated by the surgeon), postoperative blood loss (as measured from drains), blood-transfusion requirements and changes in haemoglobin and haematocrit values. Decisions regarding transfusion were based on standard clinical practice and were made by the anesthesiologist. Clinically identified bleeding complications were considered as major (if they were fatal) or requiring a transfusion, a new operation or a prolonged hospitalization period.

Statistical Analysis

The sample size of 214 patients (knee surgery) was based on the detection of a prevalent deep-vein thrombosis. Patients who never received the medication after surgery and patients who received it without a scheduled operation, were excluded from this study. Comparisons of end points within populations were analyzed with the Wilcoxon rank-sum test or with the Fisher exact test.

Results

Our observations established a medium postoperative bleeding of 950 ml with the range between 450 and 1300 ml without any evidence of increased bleeding due to anticoagulant therapy. Postoperatively, 125 (58%) patients required an isogroup blood administration. There was no evidence for some case of postoperative bleeding caused by the anticoagulant therapy. Two (0.01%) of the 214 enoxaparin-treated patients suffered pulmonary embolism whereas 37 (17%) had distal deep-vein thrombosis and 0.02% (4 patients) had proximal and distal deep-vein thrombosis. Venous thromboembolic disease occurred in 40% of the 214 enoxaparin-treated patients ($p < 0.005$; odds ratio, 2.25; 94% confidence interval, 1.61 to 2.68). This hypotheses was confirmed with a subsequent Doppler echography. This method cannot often give an exact diagnosis and, consequently, some interpretations could induce into mistake. To confirm the hypotesized diagnosis of DVT, venography was firmly indicated. In all these cases, the anticoagulant doses were readjusted starting from the prophylactic dose up to the therapeutic dose without referring to intravenous heparin. One patient, suspected for DVT on the 7th postoperative day, suffered for a massive pulmonary embolism, unforeseeable for the ongoing treatment. This complication caused a cardiac stop and the patient died although a prompt treatment. In this 2nd grade obesity patient were present hydrostatic varicosities and atrial fibrillation. Another patient showed massive pulmonary embolism and a fatal evolution 48 hrs after surgery. Echography didn’t confirme all DVT cases clinically suspected. Furthermore, 6 cases of DVT were found in the not-operated part of the body suggesting that the operative traumatism could not necessarily produce DVT on the operated part but elsewere by cause of the induced modification in the coagulation chain.

Discussion

The efficacy of low molecular weight heparins in the prevention of thromboembolic accidents after knee endoprosthesis are confirmed in sever- al studies. The DVT percentage is positioned on a 50% average. This is, in turn, the major reason of embolism which is demonstrated by
Doouss\textsuperscript{19} and Kakkar et al\textsuperscript{20} in their scientific studies and which built the hypothesis, overwhelmingly accepted, to strongly recommend the administration of low molecular weight heparin to prevent thromboembolic accidents after knee endoprosthesis. Their prophylactic use also safely reduces the fear of post surgical bleeding and related complications. In this study it was demonstrated the absence of any massive bleeding whether local haematomas were present in only 2 cases. Finally, in order to prevent major complications (like pulmonary embolism) after knee endoprosthesis, the treatment with Low Weight Molecular Heparin seems to be more desirable because effective.

\textbf{References}


