A COMPARISON OF THE EFFICACY OF A LOCAL VS BRACHIAL PLEXUS BLOCK ANAESTHESIA IN THE CARPAL TUNNEL RELEASE: THE RESULTS OF A PROSPECTIVE AND RANDOMISED TRIAL

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Carpal tunnel release can be performed in local anaesthesia, peripheral nerves blocks (either proximally or distally), intravenous regional (Bier block) and general anaesthesia. To our knowledge, in Poland operations of carpal tunnel syndrome are routinely performed under brachial plexus block anaesthesia. The aim of the study was to compare the effectiveness of local versus brachial plexus block anaesthesia for carpal tunnel decompression.

Material and methods. One hundred and fifty-five patients diagnosed with carpal tunnel syndrome were randomly allocated to the local anaesthesia or brachial plexus block. Operations were done with two minimally invasive techniques: one and two small incisions. Questionnaires received from 135 patients, 115 women (85%) and 20 men (15%) in a mean age of 57 years (range 31-87) were analyzed. Sixty-six patients (49%) received local infiltration with 2% Lignocaine, and 69 (51%) received brachial plexus block with a mixture of 2% Lignocaine and 0.5% Bupivacaine. Pre- intra- and post-operative patients’ complaints were assessed in visual analogue scale, as well as duration of anaesthesia, operation and surgeon subjective satisfaction were noted.

Results. Except tourniquet pain, there were no significant differences between the groups in the pain scores associated with disease or operation. Although tourniquet pain was significantly lower favoring brachial plexus block, but the difference was slight (VAS 1.9) and most the patients well tolerated short-time inflation of the tourniquet. No significant difference was observed in duration of the operation, whereas duration of performing anaesthesia was significantly longer in brachial plexus blocks, but the difference of the mean values was as low as 1 minute. Operation under brachial plexus block provided greater surgeon’s comfort.

Conclusions. The results of this study show similar effectiveness of local and brachial plexus block anaesthetics for carpal tunnel release, and confirm advantages of the former technique as simpler, cheaper and easier available. It seems that, according to European trends, local anaesthesia should be considered a method of choice in this operation and that fear associated with its use are not justified.

Key words: carpal tunnel decompression, local anaesthesia

Carpal tunnel release in carpal tunnel syndrome (CTS) can be performed in local anaesthesia, brachial plexus and peripheral nerves blocks, intravenous regional block, and general anaesthesia. To our knowledge, in Poland carpal tunnel release is routinely and preferably performed under brachial plexus block anaesthesia (1).

For the first time carpal tunnel release was performed under local anaesthesia in 1972 (2). Undoubtedly, advantage of that is ability to perform this procedure by surgeon himself without involving anaesthesiologist. Local anaesthesia is a shorter procedure, requiring less amount of Lignocaine, and patient can be discharged shortly after the operation in comparison to brachial block anaesthesia. This makes the procedure suitable for outpatient practice, the source of pain in local anaesthesia are advancement of needle through the skin, the increase
in tissue tension due to fluid infiltration and reaction to acidity of the Lignocaine (3). Opponents of this technique stress the ineffectiveness of the anaesthesia, increase in pain in operated site and lack of anaesthesia in brachial region were tourniquet applied (4). According to anaesthesiologists, brachial block or general anaesthesia offer better quality of the operation for both the patient and the surgeon. Data from the studies does not confirm that opinion and suggests effective level of local anaesthesia with 2% of Lignocaine evaluated in visual analogue scale scored 2-3 points (range: 0 – no pain, 10- extreme pain) (5-10). We could not find any studies directly comparing both methods of anaesthesia in carpal tunnel release.

The aim of this study was to compare the effectiveness of the local versus brachial plexus block anaesthesia for carpal tunnel decompression.

MATERIAL AND METHODS

Over a period of 13 months, between April 2007 and May 2008, a total of 155 patients with clinically and electrophysiologicaly proven carpal tunnel syndrome were admitted and operated on in the Department. The consent for participation in the study was obtained from all the patients. Of a total of 230 patients who were operated on in that period, 75 (33%) were not evaluated due to lack of consent, inability to complete the questionnaire, lack of randomisation or examination. Twenty of 155 received questionnaires were incomplete and were disqualified.

Finally, 135 questionnaires obtained from patients operated on for carpal tunnel syndrome were analysed. One hundred and fifteen (85%) were female and 20 (15%) were male. A mean age was 57 years (range 31-87). In 84 patients (62%) right hand and in 51 (38%) left hand was operated on. The duration of symptoms was in average 3 years (range from 2 months to 22 years). Nerve conducting studies were performed in 118 cases (87%) and in 17 cases (13%) the diagnosis was based on clinical grounds. All evaluated patients were hospitalised. All patients were form waiting list and were released from the ward on 2 or 3 day depending on whether the operation was performed on admission day.

The patients were located in randomised group by means of result of coin through. The allocation was performed in day of operation and the result was recorded in the patients' notes. Each patient was asked before surgery to complete the questionnaire with the personal data, duration of symptoms and results of nerve conduction studies. Subsequently the patients were familiarised with visual analogue scale and answered the level of pain due to symptoms of CTS. The number was recorded. The patients were explained again the reason for the study and asked to focus on pain during crucial point of operation (tab. 1). Patients who were in brachial block group were anaesthetised in the ward 15-60 minutes before the operation.

Technique of the anaesthesia

Brachial block was performed by one of surgeons using a mixture of 10 ml of 2% Lignocaine and 10 ml of 0.5% Bupivacaine in one syringe. This procedure have been routinely performed in our Department for a last 5 years. Usually, the operating surgeon did not perform brachial block. After localising the brachial artery the needle was inserted above the pal-

<table>
<thead>
<tr>
<th>Parameter assessed</th>
<th>Brachial plexus block n=69 chorych / patients</th>
<th>Local anaesthesia n=66 chorych / patients</th>
<th>p-value</th>
<th>z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain level (VAS)</td>
<td>srednia / zakres / SD</td>
<td>srednia / zakres / SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before surgery</td>
<td>5,5 / 0-9 / 1,9</td>
<td>5,7 / 2-9 / 1,7</td>
<td>&gt;0,57</td>
<td>0,54</td>
</tr>
<tr>
<td>At the anaesthesia</td>
<td>3,7 / 0-9 / 2,4</td>
<td>3,4 / 0-8 / 2,2</td>
<td>&gt;0,46</td>
<td>-0,72</td>
</tr>
<tr>
<td>At the operated site</td>
<td>1,1 / 0-6 / 1,5</td>
<td>1,2 / 0-10 / 1,9</td>
<td>&gt;0,81</td>
<td>0,22</td>
</tr>
<tr>
<td>Tourniquet pain</td>
<td>1,4 / 0-9 / 2,3</td>
<td>3,3 / 0-10 / 2,8</td>
<td>&lt;0,0005</td>
<td>4,71</td>
</tr>
<tr>
<td>After the operation</td>
<td>2,9 / 0-9 / 2,1</td>
<td>3,4 / 0-9 / 2,2</td>
<td>&gt;0,15</td>
<td>1,43</td>
</tr>
<tr>
<td>Time of anaesthesia (min)</td>
<td>4,2 / 1-10 / 1,6</td>
<td>3,2 / 1-10 / 2,3</td>
<td>&lt;0,005</td>
<td>-3,23</td>
</tr>
<tr>
<td>Time of surgery (min)</td>
<td>13,3 / 5-30 / 5,8</td>
<td>11,8 / 5-20 / 3,1</td>
<td>&gt;0,32</td>
<td>-0,35</td>
</tr>
</tbody>
</table>
pated pulse and advanced till patient reported paresthesiae in radial I-III fingers, and then a half of the dose was injected. After that the needle was inserted beneath the artery, an anaesthetic mixture was administrated after reporting the paresthesiae in the ulnar fingers. The timing of the procedure and the pain experienced by patients were recorded.

Local anaesthesia was performed in the operation theatre, after tourniquet inflation and preparation of the operation field. The technique was similar to Altissimi and Mancini’s (fig. 1-3) (5). A volume of 10 ml 2% Lignocaine was normally used. The needle was inserted in proximal wrist crease radially to palmaris tendon and 5 ml of Lignocaine was administrated around median nerve after its identification (fig. 1). The remaining volume of Lignocaine was used to anaesthetise the skin distally to wrist crease (fig. 2 and 3). Occasionally, skin around planned incision was infiltrated with Lignocaine.

Carpal tunnel was released by two minimally invasive techniques: one or two incisions techniques, which were described in previously published studies (fig. 4 and 5) (1). The choice of technique depended on surgeon preference. Ninety seven (72%) operations were performed with one incision and 38 (28%) operations were performed with two incisions technique. The timing of the procedure was recorded starting from the incision until wound suture. In a case of patient discomfort during operation due to pain, an additional anaesthesia was performed and the fact was noted in medical records. After surgery the patients were questioned about the pain level during the operation due to tourniquet and the procedure itself. The operating surgeon recorded the level of comfort during the operation. All patients were hospitalised till next day and were questioned about the pain in postoperative period (during night and day after surgery). All the data were recorded.

**RESULTS**

Of 135 patients, 66 (49%) were operated on under local anaesthesia and 69 (51%) were operated on under brachial plexus block. The results of pain assessment before-at-, and post-operatively, timing of anaesthesia and surgery are summarised in tab. 1. Except of the tourniquet pain, all other pain levels did not differ significantly between the groups. As it could be anticipated, the only statistically significant
correlation was noted in group with brachial plexus block associated with pain due to tourniquet, however the pain in local anaesthesia group was slight, scored a mean of 3.3 points in visual analogue scale, against a mean of 1.9 points in brachial plexus block. It suggests that most of patients tolerated well short-time inflation of the tourniquet. No significant difference was observed in duration of the operation. whereas duration of performing anaesthesia was significantly longer in brachial plexus blocks, but the difference of the mean values was only 1 minute.

Eighteen patients (26%) from brachial plexus group required additional local anaesthesia. Three patients from the brachial plexus group and one patient from the local anaesthesia group scored pre-operative pain caused by carpal tunnel syndrome 7-10 points in visual analogue scale (very severe). Three patients (4%) from the group anaesthetised with brachial plexus scored the pain during anaesthesia 7-10 points, as well as 4 patients (6%) from the group with local anaesthesia. None of the patients form brachial block group scored the intra-operative pain at site higher than 6 points, whereas 3 patients (4%) from local anaesthesia group scored it 7-10 points. The tourniquet pain was scored 7-10 by 3 patients (4%) from brachial plexus group, and by 7 patients (11%) from local anaesthesia group. After the operation (day and night) the pain was scored 7-10 by 2 patients (3%) following brachial plexus block and by one patient (1.5%) following local anaesthesia. The analysis of the questionnaires revealed, that those patients who preoperative pain 7-10 (5 patients from both groups) scored similarly the intra-operative pain and the pain after the surgery. Therefore it can be assumed, that high pain scores reported by these patients into the study resulted more form misunderstanding the visual analogue scale rather, than from factually experienced pain.

Surgeons felt a full comfort at the operation in 65 cases (94%) with brachial block anaesthesia, and in 37 cases (56%) with local anaesthesia. A moderate comfort was reported in 4 cases (6%) with brachial block and in 25 cases (38%) with local anaesthesia. In 4 cases operated on in local anaesthesia, an operating surgeon felt discomfort. The difference in surgeons comfort was statistically significant favouring brachial plexus block. Analysis of questionnaires revealed, that in 26 cases of moderate comfort and in 3 cases of discomfort after local anaesthesia, the operations were performed by one surgeon.

During the study we did not notice any complications due to anaesthesia procedures. In 5 cases (7%) after brachial block patients complained of transient dizziness, which did not require drug administration and subsided spontaneously.

**DISCUSSION**

The results of this prospective and randomised trial, did not support the opinion of some of the authors on lesser effectiveness of the local anaesthesia in carpal tunnel release. It seems to be equally effective as brachial block and the only difference concerns patients discomfort due to tourniquet. This was, however, well tolerated by majority of patients and
did not decrease the overall patients satisfaction from procedure and way of anaesthesia. Only few patients, 5 in both groups, evaluated their pain during anaesthesia, surgery, and postoperative period as very severe (VAS 7-10). However, the questionnaire analysis revealed those patients similarly classified their symptoms due to the syndrome itself. It is unlikely that carpal tunnel syndrome can provoke such a severe pain, since all these patients were treated and admitted electively and the waiting list was for 3 months. Therefore we think, that high level of pain evaluation was due to misunderstanding of visual analogue scale.

In this trial we found difficult to obtain reliable visual analogue scores regarding pain before surgery. This was important, because that level was supposed to be important in further estimation (in anaesthesia and surgery procedure). The results from the patients ranged from 0 to 10. Most of the patients who scored the baseline pain more than 5, did not use analgesics on regular basis. It was necessary to explain that in range from 0 to 10, score 7-10 indicates very severe pain, requiring regular use of strong analgesics, even intravenously. After suggestion that level 5 in VAS scale describes pain which requires taking of analgesics, the obtained data appeared more reliable. However in some cases patients did not received this explanation what caused overestimation of the pain. It was only in 5 of 135 cases.

All anaesthesia procedures were done by surgeons themselves, without anaesthesiologist support. It may leave some reservations about efficacy of the procedure, since 18 patients (26%) required additional local anaesthesia with 2% Lignocaine during operation, because of the pain and discomfort. It might be caused by too short time from anaesthesia to surgery (15 min) which did provide full nerves infiltration or poor communication with the patient due to elderly, dementia, or deafness. However, in none of the 18 cases the pain reported during operation exceeded 5 points. An additional anaesthesia prolonged the operating time for 5 min in average.

Local anaesthesia is fairly common in carpal tunnel release, however relatively rarely in Poland (5-10). As was mentioned above, the pain source is due to needle advancement, tissue infiltration, acidity of Lignocaine and tourniquet inflation. Buffered Lignocaine with sodium bicarbonate to pH 7.4 in two trials caused decrease in pain evaluation – mean VAS 7.6 for 1% Lignocaine with adrenaline vs 3.6 VAS for buffered Lignocaine (11), and mean VAS 4.2 for 1% Lignocaine with adrenaline vs 1.9 VAS for buffered Lignocaine and 1.0 VAS for buffered and warmed Lignocaine (12). In the other study alkalisation of Lignocaine did not influence the pain level in local anaesthesia, a mean VAS 2.0 for 2% Lignocaine vs 1.7 VAS for buffered Lignocaine (9). Use very fine needles for anaesthesia (dental no 4) caused statistically significant decrease in pain evaluation (mean VAS 2.2 vs VAS 3.3 with needle 6) (10). The authors regard it is due to decrease in pain during needle advancement but also smaller fluid infiltration through smaller diameter what reduces pain due to tissue infiltration. In none of the study pain due to tourniquet in operation lasting over 20 minutes was considered significant. In all studies, including our, local anaesthesia was performed before tourniquet application what decreases time of the operation. One study suggested that adrenaline administration to local anaesthetic can create bloodless operation field similar to tourniquet, however this technique was not popular (13). In specific clinical situations such as arterio-venous by-pass in patients with renal failure, this method may be useful.

Some authors claim, that tissue infiltration can disturb visibility in operating filed and identification of anatomical structures, such as median nerve and carpal retinaculum, particularly in minimal invasive and endoscopic techniques (4). In our study, for only one surgeon operating with minimally invasive technique it was of some importance, but for rest did not. In none of the study this problem was considered serious (7-12).

The technique of anaesthesia seems to be important for its efficacy. Altissimi-Mancini’s and Gale’s techniques describe administration of anaesthetic solution into carpal tunnel itself and local infiltration of the site of operation with Lignocaine (5, 8). In our technique, we blocked cutaneous branches of ulnar and median nerves on the wrist level what resulted in anaesthesia as far as to the metacarpal region. Other technique advocate infiltration only flexor retinaculum and subcutaneous tissue leaving out median nerve what suppose to help in identification of anatomical structures in operation. It seems that median nerve anaesthesia improve comfort during operation (11, 12, 13).
CONCLUSIONS

The results of this study show similar effectiveness of local and brachial plexus block anesthesia for carpal tunnel release, and confirm advantages of the former technique as simpler, cheaper and easier available. It seems that, according to European trends, local anesthesia should be considered a method of choice in this operation and that fear associated with its use is not justified.

REFERENCES


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COMMENTARY

Authors of the commented paper present a comparison of efficacy of two types of anesthesia used in the surgical treatment of the carpal tunnel syndrome. The paper indicates that the prospective randomized study was carefully planned, reliably conducted and documented. The Authors comprehensively determined the aim of the study, described its methods and clearly and meticulously presented the obtained results. The commented on the most important practical issues in the discussion and critically addressed some results that could be questioned. The only concern that I have is a method of the brachial plexus blockade. By its nature, the method involving identification of elements of the plexus by causing paresthesia through irritation with a sharp needle is painful, has low efficacy and poses a risk of serious complications; furthermore, currently it is somewhat outdated. Since newer techniques are available (identification of nerves and nervous plexuses using electrostimulation and visualization using an ultrasound guidance), identification of the nerves using not uncommonly painful paresthesia, should be abandoned. Use of a newer method of nerve identification could affect the study results.

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