Efficacy of single-shot fascia iliaca compartment blocks

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Promotor: Dr. Ph. van Loon
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Introduction

- Adequate analgesic strategy is important
- Systemic analgesics have significant side effects
- Spinal or epidural anesthesia is not always an option
- Plexus anesthesia may be difficult to administer and / or carry risks (e.g. nerve damage or local toxicity)
- The FICB might be the solution
About the FICB

- Lumbar plexus anesthesia
- Goal is to block the femoral nerve, lateral femoral cutaneous nerve and branches of the obturator nerve and genitofemoral nerve
- Through fascia lata and fascia iliaca
- Local spread in fascia iliaca compartment
- Landmark based “two pop” and ultrasound guided placement
- Single shot or catheter placement
About the FICB

Anatomy

Image by Hindawi.com
About the FICB

Anatomy  Images by cursoenarm.net and Jack vander Beek
Methods

- Literature search Medline and Cochrane using PubMed
- Terms: Fascia and iliaca and block or fascia and iliaca and compartment and block
- Of all results, abstracts were numbered, listed and screened followed by first inclusion-exclusion round
- RCT’s, Case-Control studies, Audits
- Prospective
- Outcomes had to concern clinical efficacy
- Written in English, single shot technique
Methods

- Of included articles full text version obtained
- Second inclusion-exclusion round
- Included articles were grouped
- Articles for background information added later

- Data extraction with data extraction form
- Only objectified data with relevance to clinical efficacy

- No meta-analysis done due to heterogeneity
- Statistical analyses in original articles assessed
Results - Search results

- Found articles after initial search: n = 118
- Articles potentially eligible based on abstracts: n = 30
- Excluded articles based on abstract: n = 88
- Excluded articles after obtaining full-text version: n = 10
- Included articles: n = 20
Results - Study characteristics

• Countries on every continent
• 13 RCT’s, 4 case-no-control studies, 2 case control-studies and 1 continuous audit
• Setting: 9 ED, 8 OR, 2 pre-hospital and 1 PACU
• Target groups: Children, adolescents, adults and elderly
• Indication: 11 for Hip/femoral bone fracture, 6 for elective hip/femoral bone/knee surgery, 2 for patient positioning and 1 for graft harvesting in burn victims
• Outcomes: Pain, analgesic consumption, sensory/motor block, patient satisfaction, time to first analgesic request and other (not efficacy related) factors
Results - Techniques and L.A.

• 15 studies used the landmark guided “two pop” technique
• 4 studies used ultrasound guided placement
• 1 study used both techniques

• 7 used 0,25% bupivacaine, 3 used 0,5% ropivacaine, 2 used 0,25% levobupivacaine, 2 used 2,0% lidocaine with 0,5% bupivacaine, 2 used 0,2% ropivacaine, 1 used 1,5% lidocaine, 1 used 2,0% lidocaine, 1 used 1,0% mepivacaine and 1 used 0,375% ropivacaine
## Results - Efficacy - General (vs. control)

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Outcomes</th>
<th>Results</th>
</tr>
</thead>
</table>
| Hanna (2014)| 1. Pain (VAS-score) 2. T(preoperative)AC 3. TIAL | 1. VAS-score was significantly reduced in the FICB group versus the control group starting 2 hours after block placement.  
2. The TPAC was significantly reduced for diclofenac in the FICB group versus the control group.  
3. TIAL was significantly longer in the FICB group versus the control group. |
| Kumie (2015)| 1. Pain (VAS-score) 2. T(postoperative)AC 3. T1AR | 1. VAS-score was significantly reduced in the FICB group versus the control group.  
2. The TPAC was significantly reduced for diclofenac in the FICB group versus the control group.  
3. There was no significant difference in tramadol use.  
4. The time to the first analgesic request was significantly longer in the FICB group versus the control group. |
2. Total additional opiate consumption was significantly reduced in the FICB group versus the control group.  
3. The acute length of stay was reduced with 33% in the FICB group versus the control group.  
4. Mortality was significantly lower in the FICB group versus the control group. |
| McRae (2015)| 1. Pain (VAS-score) 2. Additional analgesia consumption | 1. VAS-score was significantly reduced in FICB group versus control group at all moments of measurement.  
2. Additional opiate consumption was significantly lower in the FICB group versus the control group. |
## Results - Efficacy - General (vs. sham / no control)

<table>
<thead>
<tr>
<th>Study</th>
<th>Measures</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Godoy Monzon (2007) | 1. Pain (VAS-score)  
2. Additional analgesia consumption | 1. There was a significant decrease in pain 15 minutes to 8 hours after following block placement.  
2. Additional analgesia consumption was low. Patients analgesic requirements during the first 24 hours averaged 1,2 doses (range 1 - 4) of 75 mg diclofenac. |
| Haines (2012)     | 1. Pain (VAS-score)  
2. Additional analgesia consumption | 1. There was a significant decrease in pain following block placement with the lowest mean pain score of 1.3 at 120 min; a 76% drop in pain from just before the placement of the block.  
2. Additional analgesia consumption was low. 80% of the patients (N=16) did not request additional analgesia. |
| Krych (2013)      | 1. Pain (VAS-score / NRS-11-score)  
2. T(postoperative)AC  
3. Patient satisfaction | 1. VAS-score and NRS-11-score were on average between 4.7 (+/- 2.5) on day 0 and 3.4 (+/- 1.9) up until day five and between 3.9 (+/- 2.8) on day 0 and 2.7 (+/- 2.0) up until day five, respectively.  
2. TPAC for hydrocodone-paracetamol was on average between 1,5 (+/- 0.8) tablets on day 0 and 0,9 tablets (1,2) on day five.  
3. Twenty patients were very satisfied (67 %) and 10 were satisfied (33 %). |
2. Correlation between SVS-score and sensory block | 1. A significant decrease in pain was noted in the level of pain experienced by patients from 15 min to 8 h after the block. The SVS decrease during the first 10 minutes was higher when the internal part of the thigh was blocked.  
2. There was 1 block failure. Seven patients had a complete block, and 19 had a partial block. The 7 patients who had a complete block and 18 out of 19 patients who had a partial block required no further analgesia (SVS < 3). |
| Shariat (2013)     | 1. Pain (NRS-11-score)  
2. Total opiate consumption  
3. Sensory block | 1. There was no significant difference in pain intensity 30 and 60 minutes after block placement (NRS-11 = 4 (+/- 2) vs 5 (+/- 3) respectively) for the FICB and sham block control group. At 24 hours after block placement there was significantly more pain in the FICB group than in the control group (NRS-11 = 5 (+/- 2) vs 2 (+/- 2) respectively).  
2. There was no difference in opiate consumption between the FICB group and the control group at any point in time.  
3. At 30 minutes, all patients in the FICB had evidence of sensory block; 2 had sensory block in all 3 of the sensory territories tested. There was no sensory blockade in the control group. |
# Results - Efficacy - vs. Intravenous opiates

<table>
<thead>
<tr>
<th>Study</th>
<th>Outcomes</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Diakomi (2014) | 1. Pain (NRS - score)  
2. Spinal anesthesia performance time  
3. Quality of positioning  
4. Patient satisfaction  
5. T(postoperative)AC  
6. TIAR | 1. The FICB group showed significantly lower NRS-scores in all instances compared to the IV-fentanyl group.  
2. The FICB group showed significantly shorter spinal anesthesia performance times compared to the IV-fentanyl group.  
3. The FICB group showed significantly better quality of positioning compared to the IV-fentanyl group.  
4. The FICB group showed significantly higher patient satisfaction compared to the IV-fentanyl group.  
5. T(postoperative)AC was significantly lower in the FICB group compared to the IV-fentanyl group.  
6. TIAR was significantly longer in the FICB group compared to the IV-fentanyl group. |
| Wathen (2007)  | 1. Pain (FLACC (children aged < 5 years), CHEOPS (all children) and FACES (children aged > 5 years))  
2. Duration of pain control  
3. Additional analgesia consumption | 1. The FICB group showed significantly lower pain scores compared to the IV-morphine group.  
2. The duration of pain control was significantly longer in the FICB group compared to the IV-morphine group.  
3. Additional analgesia consumption was significantly lower in the FICB group compared to the IV-morphine group. |
| Yun (2009)     | 1. Pain (VAS-score)  
2. Spinal anesthesia performance time  
3. Patient satisfaction (quality of positioning and patient acceptance)  
4. TIAR  
5. Sensory block | 1. Baseline VAS scores were high but decreased significantly after FICB or IV-alfentanil. VAS-scores at 20min post-FICB block and 2min post-IV-alfentanil were not different. Mean VAS-score during positioning was lower in the FICB group. Mean VAS at 6h after the operation was significantly lower in the FICB group than in the IV-alfentanil group.  
2. Time to perform spinal anesthesia was shorter in the FICB group but the time to spinal anesthesia induction was shorter in the IV-alfentanil group.  
3. The quality of patient positioning for spinal anesthetic block placement was better in the FICB group. Patient acceptance after 24h in a ward was better in the FICB group.  
4. The time for the first analgesic request was shorter in the IVA group than in the FICB group.  
5. 40% of patients had a complete block (lateral femoral cutaneous, femoral and obturator nerve block). 60% of patients had a partial block (no obturator block). |
### Results - Efficacy - vs. Other systemic meds

<table>
<thead>
<tr>
<th>Study</th>
<th>Pain Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Godoy Monzon (2010)</td>
<td>Pain (VAS-score)</td>
<td>1. Both groups showed a significant decrease of VAS-scores. 15 minutes after block placement VAS scores were significantly lower in the FICB group compared to the IV-NSAID group which used diclofenac or ketorolac. The rest of the study period showed no significant difference in pain reduction.</td>
</tr>
<tr>
<td>Foss (2007)</td>
<td>Pain (10 point VRS)</td>
<td>1. VAS-scores were lower and pain relief was superior in the FICB group compared to the IM-morphine group both at rest and on movement.</td>
</tr>
</tbody>
</table>
## Results - Efficacy - vs. Others blocks

<table>
<thead>
<tr>
<th>Study</th>
<th>Pain (VAS-score / SVS-score)</th>
<th>Sensory block</th>
<th>Motor block</th>
<th>VAS-score</th>
<th>t(postoperative)AC</th>
<th>ACTH + cortisol levels</th>
<th>Pain (VAS-score)</th>
<th>Additional analgesia consumption</th>
<th>Length of hospital stay</th>
<th>Postoperative VAS-scores</th>
<th>Morphine consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capdevila (1998)</td>
<td>1. Evaluations of pain, using both scales, were comparable in both groups.</td>
<td>2. The number of femoral, genitofemoral, and obturator nerve blockades showed no significant intergroup differences. There was significantly more lateral femoral cutaneous nerve blockades in the FICB group versus the 3-in-1 group. A more rapid onset and more consistent presence of blockade was observed for the FICB group.</td>
<td>3. There were no intergroup differences in the number of motor blockades concerning the femoral nerve and the obturator nerve. However, when comparing motor and sensory blockades for a given nerve, significant differences were noted concerning the obturator nerve in both patient groups.</td>
<td>1. Up until 4 hours after surgery there was a significant decrease in VAS-scores for both the FICB group and the 3-in-1 group versus the control group, there was no difference between the FICB and the 3-in-1 group. 2-4 hours after surgery there was no significant difference between any of the groups.</td>
<td>2. Total tramadol use via PCA was significantly lower in both the FICB group and the 3-in-1 group versus the control group, there was no difference between the FICB and the 3-in-1 group.</td>
<td>1. ACTH and cortisol levels were similar in all groups 5 minutes preoperatively and 5 minutes postoperatively but significantly lower in both the FICB group and the 3-in-1 group versus the control group 60 minutes postoperatively, there was no difference between the FICB and the 3-in-1 group.</td>
<td>1. FICB and 3-in-1 blocks are equivalent in reducing pain scores at 60 min.</td>
<td>2. Additional analgesia consumption similar in both groups.</td>
<td>3. Length of hospital stay was longer in the FICB group compared to the 3-in-1 group; mean 13.5 versus 10 days respectively.</td>
<td>1. Postoperative VAS-scores did not significantly differ between the FEM and FI block groups.</td>
<td>2. T(postoperative)AC for morphine did not significantly differ between the two groups.</td>
</tr>
</tbody>
</table>
## Results - Efficacy - Techniques

| Cuignet (2005) | 1. Pain (VAS-score)  
2. Patient satisfaction  
3. T(postoperative)AC | 1. Mean static VAS scores were similar between groups during the 72-hour postoperative period. Mean dynamic VAS scores were lower for both the single-shot and continuous infusion groups for the entire 72-hour period. However, after this point VAS-scores were significantly higher for the single-shot and control groups compared to the continuous infusion group.  
2. Patient global evaluation assessment of “very good” was given more frequently in the single-shot group (48%) than in either the continuous-infusion or the control groups (33% and 26%, respectively). There was a higher incidence of patient global evaluation assessments of “poor” and “very poor” in the continuous-infusion (15% and 11%) and control groups (7% and 5%, respectively), which also compared unfavorably with the single-shot group (7% and 0% respectively).  
3. Postoperative morphine requirements (via PCA devices), were similar in the continuous-infusion and the single-shot groups and both were significantly lower than for the control group at any point in time. |
| Dolan (2008) | 1. Sensory block  
2. Motor block | 1. There was a statistically significant increase in the incidence of sensory loss in the medial aspect of the thigh from 60% to 95% under ultrasound guidance. There was no significant difference in the incidence of nerve block of anterior and lateral aspects of the thigh. Complete loss of sensation in the anterior, medial and lateral aspect of the thigh increased from 47% to 82%.  
2. Ultrasound guided placement of the FICB resulted in a statistically significant increase in the incidence of femoral and obturator nerve motor block. |
## Results – Success and adverse effects

<table>
<thead>
<tr>
<th>Study</th>
<th>Block success rate (full or partial nerve block)</th>
<th>Adverse effects (% of patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanna (2014)</td>
<td>67,00%</td>
<td>None</td>
</tr>
<tr>
<td>Kumie (2015)</td>
<td>Not specified</td>
<td>None</td>
</tr>
<tr>
<td>Lees (2014)</td>
<td>Not specified</td>
<td>0,9% (0,3% block related)</td>
</tr>
<tr>
<td>McRae (2015)</td>
<td>82,00%</td>
<td>None</td>
</tr>
<tr>
<td>Godoy Monzon (2007)</td>
<td>100,00%</td>
<td>None systemic, 3% local</td>
</tr>
<tr>
<td>Haines (2012)</td>
<td>Not specified</td>
<td>15% (not necessarily FICB related)</td>
</tr>
<tr>
<td>Krych (2013)</td>
<td>Not specified</td>
<td>None</td>
</tr>
<tr>
<td>Lopez (2003)</td>
<td>96,00%</td>
<td>None</td>
</tr>
<tr>
<td>Shariat (2013)</td>
<td>94,00%</td>
<td>Not specified</td>
</tr>
<tr>
<td>Capdevila (1998)</td>
<td>Complete block: 34%, partial block: up to 90%</td>
<td>None</td>
</tr>
<tr>
<td>Deniz (2014)</td>
<td>87,50%</td>
<td>5% (not necessarily FICB related)</td>
</tr>
<tr>
<td>Reavley (2014)</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Diakomi (2014)</td>
<td>Not specified</td>
<td>None</td>
</tr>
<tr>
<td>Yun (2009)</td>
<td>100,00%</td>
<td>None</td>
</tr>
<tr>
<td>Wathen (2007)</td>
<td>Not specified</td>
<td>4% systemic, 15% local</td>
</tr>
<tr>
<td>Farid (2010)</td>
<td>Not specified</td>
<td>None</td>
</tr>
<tr>
<td>Godoy Monzon (2010)</td>
<td>Not specified</td>
<td>None systemic, 3% local</td>
</tr>
<tr>
<td>Foss (2007)</td>
<td>67,00%</td>
<td>None</td>
</tr>
<tr>
<td>Cuignet (2005)</td>
<td>100,00%</td>
<td>None</td>
</tr>
</tbody>
</table>
Discussion and limitations - Discussion

- Relative paucity of data
- Generally effective and superior to standard care
- Superior to intravenous and intramuscular opiates
- Equal / mildly superior to intravenous NSAID; more research needed
- Equal to other lumbar plexus blocks but safer or easier
- Ultrasound technique superior but not always necessary or available
- Single shot technique superior to continuous infusion
Discussion and limitations - Limitations

• We only searched Medline and Cochrane, not Google scholar or CINAHL
• No meta-analysis possible
• Some included studies were non-controlled
• Only single-shot technique evaluated
• Side-effects and feasibility not a primary outcome
• Cost-effectiveness not studied
Conclusion

• The FICB is effective, safe and easy to perform
• The FICB should be considered in all patients with serious hip, thigh or knee injuries or surgery if there are no contraindications for plexus anesthesia
• If possible, consider ultrasound guided placement
• Effectivity may be overestimated
• Apparently no consensus regarding “best practice” (type and volume of LA, exact placement technique, …)
• Further research is warranted
Any questions?