Regional analgesia in total hip arthroplasty: Evidence and recommendations

prospect

procedure specific postoperative pain management

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Background

- The PROSPECT initiative provides evidence-based and procedure-specific recommendations for postoperative pain management, formulated through an international collaboration of surgeons and anaesthesiologists.[1]
- Total hip arthroplasty (THA) is performed on high-risk surgical populations; typically patients are elderly and have significant co-morbidities – therefore, pain control should be balanced to optimise functional recovery and reduce postoperative morbidity and mortality.
- Regional analgesic techniques are commonly used in THA, but each method has benefits and drawbacks.
- PROSPECT presents evidence and recommendations for regional analgesia in total hip arthroplasty.

Methods

- A systematic review of the literature was performed according to the protocol of the Cochrane collaboration. MEDLINE and EmBASE were searched from 1966–July 2004 using predefined search terms.
- Studies included in the review were randomised trials of regional techniques in THA.
- All included studies were required to report pain scores using a visual analogue scale (VAS) or verbal rating scale (VRS). All pain scores were converted to VAS 1–100 mm. Other outcomes were recorded where available. Results are reported as significant where $p<0.05$; n = number of studies.
- Supplementary information from similar orthopaedic procedures and clinical practice was also assessed.
- Recommendations for regional analgesia in THA, based on the evidence, were formulated by consensus of the PROSPECT working group.

Results

- A total of 32 studies examined regional analgesia in THA: epidural analgesia (12); spinal analgesia (14); peripheral nerve block (4). Two studies examined spinal analgesia *versus* epidural or peripheral nerve block analgesia.

Epidural analgesia, n=12 (Table 1)

- Continuous epidural (local anaesthetic [LA] ± morphine) decreased pain scores on movement and at rest compared with general anaesthetic (GA) + IV morphine on demand.[2, 3]
- Bolus epidural pethidine was superior to bolus IM pethidine for reducing pain scores ≤1 h postoperatively.[4]
- Bolus or infused epidural clonidine was effective in reducing pain scores[5, 6] and supplementary analgesic use[5-7] and for extending the time to first analgesic request.[5-7]

Table 1. Effects of different epidural regimens on postoperative pain scores and use of supplementary analgesics.

Comparison		Postoperative effects *versus* control	
Epidural	**Control**	**Pain scores**	**Analgesic use**
Continuous LA ± morphine	GA + systemic morphine	[2, 3] ↓	[2] ↔
Bolus pethidine	Bolus IM pethidine	[4] ↓	[4] ↔
Bolus or infused clonidine (± LA)	Bolus or infused epidural LA alone	[5] ↓ [7] ↔	[5, 7] ↓
Bolus plus infused clonidine, or bolus clonidine + bolus and infused morphine	Bolus plus infused epidural morphine alone	[6] ↓	[6] ↓
Bolus bupivacaine + fentanyl	Bolus epidural bupivacaine + morphine	[22] ↔	[22] ↔
Bolus ropivacaine + fentanyl	Bolus epidural fentanyl alone	[23] ↔	
Infusion bupivacaine *versus* ropivacaine *versus* levobupivacaine		[24, 25] ↔	[24, 25] ↔
Infusion sufentanil (0.5 µg/ml *versus* 0.75 µg/ml *versus* 1.0 µg/ml) + ropivacaine 0.1%		[26] ↔	[26] ↔
Catheter insertion: tip of Tuohy needle 45º to the operative side	Tip of Tuohy needle 90º cephalad	[27] ↔	[27] ↓

Table 2. Effects of different spinal regimens on postoperative pain scores and use of supplementary analgesics.

Comparison		Postoperative effects *versus* control		
Spinal	**Control**	**Pain scores**	**Analgesic use**	**Side-effects**
Opioid + LA	Spinal LA alone	[8-13] ↓	[9-13] ↓	↑ PONV[9, 11-13]
Continuous bupivacaine	Single-shot spinal bupivacaine anaesthesia + IV PCA morphine	[14] ↓	[14] ↓	↑ PONV[14]
PCA bupivacaine	On-demand spinal bupivacaine	[15] ↓	[15] ↓	
Bolus morphine	Psoas compartment block using ropivacaine	[20] ↓	[20] ↓	↑ Urinary retention[20]
Continuous bupivacaine	Continuous epidural bupivacaine	[21] ↓	[21] ↓	↓ PONV[21]
Bolus nalbuphine, morphine-6-glucuronide, diamorphine, and clonidine	Spinal bolus morphine	[28, 29, 30, 9] ↔	[28, 30] ↔ [29, 9] ↑	
Clonidine + LA and/or opioid	Spinal LA and/or opioid alone	[10, 31] ↔ [9] ↓		
Levobupivacaine	Spinal bupivacaine	[32] ↔	[32] ↔	
Fentanyl	Spinal sufentanil	[33] ↔	[33] ↔	

Spinal analgesia, n=14 (Table 2)

- Spinal LA + opioid decreased pain scores during 0–8 h (Figure 1), and 8–16 h, but not 16–32 h, decreased opioid use (Figure 2), and extended the time to first analgesic request, compared with LA alone, but may increase the incidence of PONV (5 studies, 7 arms OR 1.85 [1.15, 2.99], p=0.01).[8-13]
- Continuous spinal LA was superior to single shot spinal anaesthesia + IV PCA morphine for reducing pain scores and the incidence of PONV.[14]
- Bupivacaine administered by PCA via a spinal catheter significantly reduced pain scores and supplementary analgesic use compared with on-demand spinal bupivacaine.[15]

Peripheral nerve block, n=4 (Table 3)

- Bolus psoas compartment block + GA reduced intra-operative fentanyl, pain scores,[16, 17] postoperative morphine use[16, 17] and blood loss[16] compared with GA alone.
- Psoas compartment block decreased pain scores and initial opioid use compared with femoral nerve block.[17]
- Bolus femoral nerve block + GA reduced time to first analgesic request in one study,[17] but had no significant effect on pain scores or opioid use compared with GA alone.[17, 18]
- Femoral nerve block delivered by PCA provided no benefit over delivery by continuous infusion for reducing postoperative pain scores.[19]

Spinal analgesia versus psoas compartment block or epidural analgesia (n=2)

- Bolus spinal morphine reduced pain scores, and opioid use, but increased urinary retention by 3-fold compared with bolus psoas compartment block.[20]
- Continuous spinal morphine reduced pain scores at rest and on movement, supplementary analgesic use and the incidence of PONV compared with epidural morphine.[21]

Table 3. Effects of different peripheral nerve block regimens on postoperative pain scores and use of supplementary analgesics.

Comparison		Postoperative effects *versus* control	
Nerve block	**Control**	**Pain scores**	**Analgesic use**
Bolus psoas compartment block	Placebo	[16, 17] ↓	[16, 17] ↓
Bolus psoas compartment block	Femoral nerve block	[17] ↓	[17] ↓
Bolus femoral nerve block	Placebo	[17, 18] ↔	[17, 18] ↔
PCA femoral nerve block	Continuous femoral nerve block	[19] ↔	[19] ↔

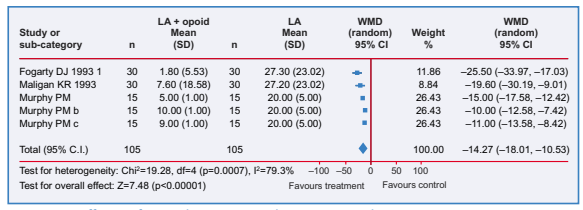

Figure 1. Effects of spinal LA + opioid *versus* spinal LA on VAS pain scores.

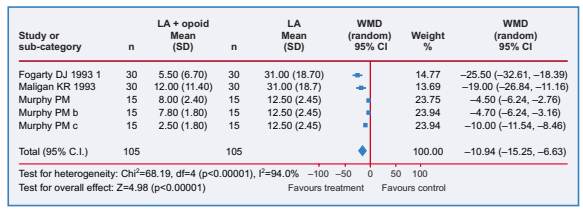

Figure 2. Effects of spinal LA + opioid *versus* spinal LA on morphine use, mg.

Conclusions

- Regional techniques have superior analgesic efficacy and decrease postoperative morbidity compared with systemic regimens.
- Peripheral neural blocks provided effective analgesia, and are associated with fewer adverse effects than neuraxial or parenteral analgesia.
- On balance of risks and benefits, peripheral neural blocks are recommended for routine use with general anaesthesia in THA, to be delivered either as a continuous infusion, or by PCA or on-demand.
- Spinal analgesia (LA + opioid) may also be used, because it provided effective pain relief and reduction of analgesic use, but urinary retention should be monitored.
- Spinal analgesia provided greater pain relief, and produces a more profound nerve block, than epidural analgesia.
- Epidural analgesia provides a less favourable risk/benefit profile in most patients, but may be considered for patients at high risk of cardiopulmonary morbidities.
- All regional techniques for anaesthesia/analgesia have a recognised failure rate, which must be considered when planning pain relief for THA.
- Further comparative studies of regional techniques are warranted, to assess pain, mobility and hospital stay.

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