

# Recommendations for atraumatic versus conventional lumbar puncture needles

## Main editor

Bram Rochweg, Francois Lamontagne

## Publishing Information

v1.0 published on 22.05.2018



WikiRecs group

## Contact

# Sections

Summary of recommendations.....	4
1 - Atraumatic versus conventional lumbar puncture needles.....	5
References .....	12

## Summary of recommendations

### 1 - Atraumatic versus conventional lumbar puncture needles

**Strong Recommendation**

We suggest using atraumatic needles instead of conventional needles when performing a lumbar puncture regardless of the indication

# 1 - Atraumatic versus conventional lumbar puncture needles

## Strong Recommendation

We suggest using atraumatic needles instead of conventional needles when performing a lumbar puncture regardless of the indication

### Practical Info

- Various atraumatic needles subtypes exist and the terminology varies - the terms pencil point or cone-shaped needles are sometimes used interchangeably
- Most clinicians found atraumatic and conventional needles similar to use, especially when the atraumatic needle was inserted through the same skin puncture used for local anaesthesia, or using an introducer needle
- Atraumatic needles do not eliminate the risk of complications entirely, and clinicians should continue to discuss potential adverse consequences of the lumbar puncture with their patients
- The per-unit cost of atraumatic needles may be greater than the cost of conventional needles, but cost-effectiveness studies suggest that they are ultimately cost-effective because of a decreased need for additional care (perspective of the third-party payer) and lost working hours for patients (perspective of the patients and society). Moreover, similar to conventional needles, the per-unit cost varies on the specific needle subtype, and manufacturer.

### Who does this recommendation apply to?

The panel is confident that the recommendation applies to all patients who require a lumbar puncture and all physicians, as the results were consistent across all predefined subgroups.

### Key Info

#### Benefits and harms

Substantial net benefits of the recommended alternative

Use of atraumatic needles meaningfully decreases the risk of postdural puncture headache by 5.9% as well as the risk of hearing disturbances (4%), nerve root irritation (3.7%), return to hospital for intravenous fluids and controlled analgesia (2.2%), and the need for epidural blood patches (1.2%).

In contrast, the use of atraumatic needles has little or no effect on the risk of backache, the incidence of traumatic tap, failed lumbar punctures, and the probability of success on first attempt.

There are no differences in the effects of atraumatic versus conventional needles between subgroups defined by age and sex of patients, the prescription or use of prophylactic measures, needle gauge, position of the patient during the lumbar puncture, the clinical specialty of the individual performing the lumbar puncture, or the indication for the procedure.

It is unlikely that new information will change interpretation for outcomes for which the evidence is of high to moderate quality.

The panel was less confident about whether the use of atraumatic needles affects the efficiency of CSF drainage (i.e. the time required to draw the necessary amount of CSF) regardless of the indication. It is likely there are other more significant factors that influence drainage efficiency than just needle type. Also, this outcome is of varying importance depending on the context and indication for lumbar puncture.

#### Quality of evidence

High

We have high certainty that use of atraumatic needles meaningfully decreases the risk of postdural puncture headache, (both severe and mild), other headache, hearing disturbance, return to hospital for intravenous fluids and controlled analgesia or need for epidural blood patch.

We have moderate certainty that use of atraumatic needles decreases the risk of nerve root irritation due to indirect study results (the definition of nerve root irritation was not uniform across studies and differed from the definition used in the systematic review - pain radiating to lower limbs after the lumbar puncture).

We have high certainty that use of atraumatic needles has little or no effect on the risk of backache, failed lumbar puncture, and probability of success on first attempt.

We have moderate certainty that use of atraumatic needles has little or no effect on the risk of traumatic tap (the definition of traumatic tap was not uniform across studies).

We have very low certainty that use of atraumatic needles affects the efficiency of CSF drainage due to the fact that drainage efficiency was not measured in available studies. Conclusions regarding drainage efficiency were drawn from the observation that the gauge of atraumatic needles used in the available studies, which is expected to bear on drainage efficiency, was equal or greater than the gauge of conventional needles.

**Preference and values**

No substantial variability expected

The panel placed high value on the large reduction in symptoms that patients may suffer following the procedure. The panel believes that values and preferences regarding all important outcomes are unlikely to vary greatly across patients. For example, given the lack of detectable harm from atraumatic needles, and the substantial reduction in headaches, we anticipate that no patients would opt for lumbar puncture needles associated with a greater risk of severe headaches. In contrast, the panel believes that there is considerable variability in how much importance individual patients and physicians attribute to traumatic taps (lumbar punctures contaminated with red blood cells negatively impacting fluid analysis). Accordingly, this outcome was considered to have limited importance in the recommendation.

The panel felt confident that atraumatic needles would be acceptable to patients, although this was not measured in the systematic review. Most clinicians found atraumatic and conventional needles similar to use, especially when the atraumatic needle was inserted through the same skin puncture used for local anaesthesia, or using an introducer needle.

**Resources and other considerations**

No important issues with the recommended alternative

The panel reviewed three published cost-effectiveness studies. In those studies, the per-unit cost of atraumatic needles was greater than the cost of conventional needles, but they were ultimately cost-reducing because of a decreased need for additional care (perspective of the third-party payer) and lost working hours for patients (perspective of the patients and society). Moreover, similar to conventional needles, the per-unit cost varies on the specific needle subtype, and manufacturer.

**Rationale**

We issue a strong recommendation for atraumatic needles in all patients undergoing lumbar puncture because we believe that the desirable consequences clearly outweigh the undesirable consequences when compared to conventional needles. In the absence of conclusive cost-effectiveness analyses, potential cost implications are offset by the lack of effect modification with needle type and the fact that the cost of certain atraumatic needles is equivalent to conventional needles.

**Clinical Question/ PICO**

- Population:** Patients undergoing lumbar puncture for any indication
- Intervention:** Lumbar puncture with atraumatic needle
- Comparator:** Lumbar puncture with conventional needle

Outcome Timeframe	Study results and measurements	Absolute effect estimates		Certainty in effect estimates (Quality of evidence)	Plain text summary
		Conventional needle	Atraumatic needle		
Postdural puncture	Relative risk 0.4 (CI 95% 0.34 - 0.47) Based on data from	<b>98</b>	<b>39</b>	<b>High</b>	Use of atraumatic needles decreases the risk of postdural puncture

<p><b>headache</b><sup>1</sup> Within five days of lumbar puncture</p> <p>5 Important</p>	<p>24,901 patients in 97 studies. (Randomized controlled)</p>	<p>per 1000                      per 1000</p> <p>Difference: <b>59 fewer</b> per 1000 ( CI 95% 65 fewer - 52 fewer )</p>	<p>headache</p>
<p><b>Severe postdural puncture headache</b><sup>2</sup> Within five days of lumbar puncture</p> <p>5 Important</p>	<p>Relative risk 0.41 (CI 95% 0.28 - 0.59) Based on data from 5,178 patients in 37 studies. (Randomized controlled)</p>	<p><b>42</b>                                      <b>17</b> per 1000                                      per 1000</p> <p>Difference: <b>25 fewer</b> per 1000 ( CI 95% 30 fewer - 17 fewer )</p>	<p><b>High</b>                      Use of atraumatic needles decreases severe postdural puncture headache</p>
<p><b>Mild postdural puncture headache</b><sup>3</sup> Within five days of lumbar puncture</p> <p>4 Important</p>	<p>Relative risk 0.52 (CI 95% 0.38 - 0.7) Based on data from 7,524 patients in 37 studies. (Randomized controlled)</p>	<p><b>44</b>                                      <b>23</b> per 1000                                      per 1000</p> <p>Difference: <b>21 fewer</b> per 1000 ( CI 95% 27 fewer - 13 fewer )</p>	<p><b>High</b>                      Use of atraumatic needles decreases mild postdural puncture headache</p>
<p><b>Any headache</b><sup>4</sup> Maximal follow-up ranged from 2 days to 3 weeks</p> <p>4 Important</p>	<p>Relative risk 0.5 (CI 95% 0.43 - 0.57) Based on data from 25,549 patients in 101 studies. (Randomized controlled)</p>	<p><b>129</b>                                      <b>65</b> per 1000                                      per 1000</p> <p>Difference: <b>64 fewer</b> per 1000 ( CI 95% 74 fewer - 55 fewer )</p>	<p><b>High</b>                      Use of atraumatic needles decreases any headache</p>
<p><b>Backache</b><sup>5</sup> Maximal follow-up ranged from 2 days to 3 weeks</p> <p>4 Important</p>	<p>Relative risk 0.96 (CI 95% 0.84 - 1.17) Based on data from 5,431 patients in 30 studies. (Randomized controlled)</p>	<p><b>166</b>                                      <b>159</b> per 1000                                      per 1000</p> <p>Difference: <b>7 fewer</b> per 1000 ( CI 95% 27 fewer - 28 more )</p>	<p><b>High</b>                      Use of atraumatic needles has little or no difference on backache</p>
<p><b>Hearing disturbance</b><sup>6</sup> Maximal follow-up ranged from 2 days to 3 weeks</p> <p>5 Important</p>	<p>Relative risk 0.25 (CI 95% 0.11 - 0.6) Based on data from 1,099 patients in 9 studies. (Randomized controlled)</p>	<p><b>53</b>                                      <b>13</b> per 1000                                      per 1000</p> <p>Difference: <b>40 fewer</b> per 1000 ( CI 95% 47 fewer - 21 fewer )</p>	<p><b>High</b>                      Use of atraumatic needles decreases the risk of hearing disturbance</p>

<p><b>Nerve root irritation</b><sup>7</sup> Maximal follow-up ranged from 2 days to 3 weeks</p> <p>5 Important</p>	<p>Relative risk 0.71 (CI 95% 0.54 - 0.92) Based on data from 1,496 patients in 13 studies. (Randomized controlled)</p>	<p><b>126</b> per 1000</p> <p><b>89</b> per 1000</p> <p>Difference: <b>37 fewer</b> per 1000 ( CI 95% 58 fewer - 10 fewer )</p>	<p><b>Moderate</b> Due to serious indirectness<sup>8</sup></p> <p>Use of atraumatic needles decreases the risk of nerve root irritation</p>
<p><b>Traumatic tap</b><sup>9</sup> Immediate</p> <p>2 Not Important</p>	<p>Relative risk 0.87 (CI 95% 0.53 - 1.42) Based on data from 1,585 patients in 9 studies. (Randomized controlled)</p>	<p><b>65</b> per 1000</p> <p><b>57</b> per 1000</p> <p>Difference: <b>8 fewer</b> per 1000 ( CI 95% 31 fewer - 27 more )</p>	<p><b>Moderate</b> Due to serious indirectness<sup>10</sup></p> <p>Use of atraumatic needles has little or no impact on the risk of traumatic tap</p>
<p><b>Need for intravenous fluids or controlled analgesia</b></p> <p>Maximal follow-up ranged from 2 days to 3 weeks</p> <p>4 Important</p>	<p>Relative risk 0.44 (CI 95% 0.29 - 0.64) Based on data from 7,183 patients in 37 studies. (Randomized controlled)</p>	<p><b>39</b> per 1000</p> <p><b>17</b> per 1000</p> <p>Difference: <b>22 fewer</b> per 1000 ( CI 95% 28 fewer - 14 fewer )</p>	<p><b>High</b></p> <p>Use of atraumatic needles decreases the need for intravenous fluids or controlled analgesia</p>
<p><b>Need for epidural blood patch</b></p> <p>Maximal follow-up ranged from 2 days to 3 weeks</p> <p>4 Important</p>	<p>Relative risk 0.5 (CI 95% 0.33 - 0.75) Based on data from 6,938 patients in 53 studies. (Randomized controlled)</p>	<p><b>24</b> per 1000</p> <p><b>12</b> per 1000</p> <p>Difference: <b>12 fewer</b> per 1000 ( CI 95% 16 fewer - 6 fewer )</p>	<p><b>High</b></p> <p>Use of atraumatic needles decreases the need for epidural blood patches</p>
<p><b>Failed lumbar puncture</b><sup>11</sup> Immediate</p> <p>4 Important</p>	<p>Relative risk 0.86 (CI 95% 0.58 - 1.27) Based on data from 5,514 patients in 28 studies. (Randomized controlled)</p>	<p><b>38</b> per 1000</p> <p><b>33</b> per 1000</p> <p>Difference: <b>5 fewer</b> per 1000 ( CI 95% 16 fewer - 10 more )</p>	<p><b>High</b></p> <p>Use of atraumatic needles has little or no impact on the risk of failed lumbar puncture</p>
<p><b>Successful lumbar puncture on first attempt</b><sup>12</sup> Immediate</p>	<p>Relative risk 0.99 (CI 95% 0.96 - 1.02) Based on data from 8,782 patients in 37 studies. (Randomized controlled)</p>	<p><b>876</b> per 1000</p> <p><b>867</b> per 1000</p> <p>Difference: <b>9 fewer</b> per 1000 ( CI 95% 35 fewer - 18 more )</p>	<p><b>High</b></p> <p>Use of atraumatic needles has little or no impact on the likelihood of successful lumbar puncture on first attempt</p>

<p>4 Important</p> <p><b>Drainage efficiency</b> <sup>13</sup> Immediate</p> <p>Based on data from 0 patients in 0 studies.</p> <p>3 Not Important</p>	<p>Drainage efficiency was not measured in existing studies. It is plausible that the most significant predictor of drainage efficiency is needle gauge. In the studies included in the systematic review, needle gauge was equal or larger for atraumatic needles. This provides indirect evidence that drainage efficiency for atraumatic needles is equivalent or greater compared to conventional needles.</p>	<p><b>Low</b> Due to very serious indirectness <sup>14</sup></p>	<p>Use of atraumatic needles may improve drainage efficiency slightly</p>
--	--	--	---

Practical issues	Lumbar puncture with conventional needle	Lumbar puncture with atraumatic needle	Both
------------------	--	--	------



Procedure and device  
Terminology

Atraumatic needles are sometimes referred to as pencil point or cone-shaped needles.



Procedure and device  
Different needle subtypes

This recommendation does not make a distinction between different atraumatic needles subtypes.



Procedure and device  
Transitioning to atraumatic needles

Although most clinicians found atraumatic and conventional needles similar to use, it may be more difficult to perforate the skin when using atraumatic needles. Potential solutions include using a sharp needle to perforate the skin before inserting the atraumatic needle, or using an introducer needle.



Coordination of care

The transition from conventional to atraumatic needles may require coordination with individuals responsible for supply of lumbar puncture needles locally



Adverse effects, interactions and antidote  
Risk of

Atraumatic needles do not eliminate the risk of complications entirely, and clinicians should continue to discuss potential adverse consequences of the



complications

lumbar puncture with their patients.



Physical well-being  
Applicability of study results to unconscious patients

It is unclear whether the benefits of atraumatic needles would be observed in patients who are unconscious (e.g. sedated in an intensive care unit). The panel believed that the recommendation is generalizable to these patients as data suggests that postdural-puncture headache can persist for several days and pain can be felt even under sedation.



Costs and access  
Cost-effectiveness

The per-unit cost of atraumatic needles may be greater than the cost of conventional needles, but cost-effectiveness studies suggest that they are cost-effective due to reductions in the need for additional care (perspective of the third-party payer) and lost working hours for patients (perspective of the patients and society). Moreover, similar to conventional needles, the per-unit cost varies on the specific needle subtype, and manufacturer.

1. An orthostatic headache occurring within 5 days of lumbar puncture, secondary to cerebrospinal fluid leakage into the epidural space. Four diagnostic criteria are defined by the ICHD III for postdural-puncture headache: headache is secondary to cerebrospinal fluid leakage, dural puncture was done, headache developed within 5 days of dural puncture, which remits spontaneously within 2 weeks or after sealing of the puncture site with an autologous epidural blood patch, and all other causes of headache were excluded.
2. Severity of postdural-puncture headache was assessed on the basis of intensity using a numerical ranking of 0–10 on the visual analogue scale and the required treatment regimen. Severe postdural puncture headache corresponds to a visual analogue scale score of 8–10 or requires an epidural blood patch, or both.
3. Severity of postdural-puncture headache was assessed on the basis of intensity using a numerical ranking of 0–10 on the visual analogue scale and the required treatment regimen. Mild postdural puncture headache corresponds to a visual analogue scale score of 1–3 or responds to over the counter analgesics and bed rest, or both.
4. 'Any headache' encompassed postdural-puncture headache and all headaches not fulfilling the above criteria for postdural-puncture headache (ie, non-specific headaches).
5. Any pain in the lumbar region after puncture.
6. Hearing disturbance was defined as tinnitus or hearing loss after puncture.
7. Nerve root irritation was defined as pain radiating to lower limbs after puncture.
8. **Inconsistency: No serious . Indirectness: Serious . Imprecision: No serious . Publication bias: No serious .**
9. Traumatic tap was defined as the presence of blood in the cerebrospinal fluid on visual inspection.
10. **Inconsistency: No serious . Indirectness: Serious . Imprecision: No serious . Publication bias: No serious .**

11. Failure rate included all instances in which a puncture attempt was made but cerebrospinal fluid could not be obtained.
12. Lumbar puncture was defined as successful on the first attempt if cerebrospinal fluid was obtained during the first puncture.
13. Drainage efficiency limits the total duration of the intervention and the associated discomfort for the patient
14. **Inconsistency: No serious . Indirectness: Very Serious .** Drainage efficiency was not reported. It is inferred from available evidence on the gauge of needles compared in existing studies. ; **Imprecision: No serious . Publication bias: No serious .**

## References

[1] Nath S, Koziarz A, Badhiwala JH, Alhazzani W, Jaeschke R, Sharma S, Banfield L, Shoamanesh A, Singh S, Nassiri F, Oczkowski W, Belley-Côté E, Truant R, Reddy K, Meade MO, Farrokhyar F, Bala MM, Alshamsi F, Krag M, Etxeandia-Ikobaltzeta I, Kunz R, Nishida O, Matouk C, Selim M, Rhodes A, Hawryluk G, Almenawer SA : Atraumatic versus conventional lumbar puncture needles: a systematic review and meta-analysis.. *Lancet (London, England)* 2017; [Pubmed Journal](#)

[2] Dakka Y, Warra N, Albadareen RJ, Jankowski M, Silver B : Headache rate and cost of care following lumbar puncture at a single tertiary care hospital.. *Neurology* 2011;77(1):71-4 [Pubmed Journal](#)

[3] Engedal TS, Ørding H, Vilholm OJ : Changing the needle for lumbar punctures: results from a prospective study.. *Clinical neurology and neurosurgery* 2015;130 74-9 [Pubmed Journal](#)

[4] Tung CE, So YT, Lansberg MG : Cost comparison between the atraumatic and cutting lumbar puncture needles.. *Neurology* 2012;78(2):109-13 [Pubmed Journal](#)