VISIONAIRE®: More efficient for total knee arthroplasty (TKA) than conventional techniques

**Purpose**
To systematically evaluate and summarise the current evidence on the clinical performance of VISIONAIRE (Smith & Nephew, Memphis, TN, USA) in TKA.

**Systematic literature review**

- **59** studies reporting on VISIONAIRE
- **19** eligible studies with outcomes of interest

**Results of meta-analysis**
Compared with conventional instrumentation, VISIONAIRE:

- Reduced the length of hospital stay by **10.2%** (0.46 days; p=0.0023)
- Reduced the odds of an outlier in the mechanical axis by **46%** (p<0.0001)
- Less likely to require a blood transfusion by **53%** (p=0.01)
- Led to more efficient operations, with reductions in:
  - Time in the operating room (**9.6%** shorter; p=0.0004)
  - Operating room turnover time (**42%** shorter; p=0.022)
  - Tourniquet time (**20.2%** shorter; p=0.0563)

**Conclusion**
VISIONAIRE patient-matched cutting guides have been extensively published on in the literature. Results from this meta-analysis show that their use leads to improvements in mechanical axis accuracy, efficiency in surgical procedures and patient outcomes in comparison with conventional techniques.
Methods

Literature search

A thorough search of the peer-reviewed literature was conducted. Please refer to Appendices for further detail on the eligibility criteria and literature search.

The search strategy was as follows:

<table>
<thead>
<tr>
<th>Inclusion criteria:</th>
<th>Exclusion criteria:</th>
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<tbody>
<tr>
<td>• English-language paper</td>
<td>• Non-clinical study</td>
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<td>• Compared VISIONAIRE™ to conventional instrumentation</td>
<td>• Repeats data set from another study</td>
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</table>

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- Non-clinical study
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Figure 1. Search strategy

Characteristics of 19 eligible studies are summarised in Figure 2, with further details found in Table 1.

Figure 2. Study characteristics

Mean age:
- VISIONAIRE: 65.1 years
- Conventional: 66.3 years

Mean percentage of male patients:
- VISIONAIRE: 43.3%
- Conventional: 45.4%

Mean sample size:
- VISIONAIRE: 63.5 knees
- Conventional: 51.6 knees

Total number of knees:
- VISIONAIRE: 1,206 knees
- Conventional: 981 knees
Results

All 19 studies were included in a meta-analysis, the details of which are provided in the Appendices. This meta-analysis offered results for the following outcomes:

**Patient outcomes**

Length of hospital stay

- Four studies reported on length of hospital stay (only unilateral TKA studies were included in order to not over-estimate any treatment effect)\(^1\)\(^-\)\(^4\)
  - VISIONAIRE patients spent 0.46 fewer days in hospital than conventional techniques (\(p=0.0023\); Figure 3)
  - This equates to 10.2% less time spent in hospital

Post-operative complications

- Four studies reported on post-operative complications\(^2\)\(^-\)\(^7\)
  - There was a 34% reduction in odds of post-operative complications with VISIONAIRE in comparison to conventional techniques, but this did not reach significance (\(p=0.195\))

Blood loss

- Six studies reported on the odds of requiring a blood transfusion with VISIONAIRE or conventional techniques\(^2\)\(^-\)\(^4\),\(^8\),\(^15\),\(^16\)
  - The odds of requiring a blood transfusion were 53% lower with VISIONAIRE compared with conventional techniques (OR, 0.47; \(p=0.01\); Figure 4)

**Accuracy**

Mechanical axis outliers

- Ten studies reported on the mechanical axis outliers after TKA with VISIONAIRE or a conventional technique\(^3\)\(^-\)\(^5\),\(^8\),\(^15\)
  - Meta-analysis revealed significantly reduced odds of outliers with VISIONAIRE (13%) than with conventional techniques (21%); odds ratio (OR), 0.55; \(p=0.0001\); Figure 5
  - No significant differences were found for the overall coronal component alignment (OR, 0.61), overall sagittal component alignment (OR, 1.29) or femoral component rotation alignment (OR, 0.41)

**Efficiency**

Only data for unilateral TKAs were included in order to not overestimate any treatment effect.
Results (cont’d)

Operating room time

- Ten studies reported on the length of time spent in the operating room\textsuperscript{1-2,5,6,11,12,15-17}.
  - VISIONAIRE\textsuperscript{\textregistered} was on average 7.5 minutes quicker than conventional techniques (\(p=0.0004\)), resulting in 9.6\% less time than conventional techniques (Figure 6).

Operating room turnover time

- One study reported on operating room turnover time\textsuperscript{16}.
  - Turnover time between cases was 42\% shorter with VISIONAIRE (6.4 minutes shorter; \(p=0.022\)) than conventional techniques (Figure 7).

Tourniquet time

- Four studies reported on tourniquet time\textsuperscript{2,12,16,17}.
  - Mean difference in tourniquet time of 13.52 minutes between VISIONAIRE and conventional techniques.
  - VISIONAIRE took approximately 20.2\% less time with tourniquet (13.52 minutes less time; \(p=0.0563\)) than conventional techniques (Figure 8).

Please refer to Appendices for further information on the study results.
Discussion

- VISIONAIRE™ has been extensively published on, with over 50 clinical papers describing its use.

- In clinical use, TKAs performed using VISIONAIRE have improved mechanical axis alignment accuracy compared with conventional instrumentation\(^3,5,8-15\).

- VISIONAIRE optimises the operating room compared with conventional instrumentation:
  - 10% reduction in overall operating room time\(^1,3,5,6,11,12,15,17\).
  - 20% reduction in tourniquet time\(^2,12,16,17\).
  - 40% reduction in operating room turn-over time\(^16\).

- VISIONAIRE improves patient outcomes:
  - Patients with VISIONAIRE TKAs have a 10% shorter stay in hospital\(^1-4\).
  - Although statistically insignificant the reduction in post-operative complications may be a clinically important finding, suggesting that more data collection is needed in order to determine a significant difference or trend.
  - VISIONAIRE TKA operations result in less blood loss compared to conventional instrumentation TKAs\(^2-4,8,15,16\).

Conclusion

VISIONAIRE-patient matched cutting guides have been extensively published on in the literature. Results from this meta-analysis show that its use leads to improvements in mechanical axis accuracy, efficiency in surgical procedures and patient outcomes in comparison with conventional techniques.
<table>
<thead>
<tr>
<th>Study, year</th>
<th>Level I: Randomised controlled trials</th>
<th>Level II: Prospective, comparative</th>
<th>Level III: Retrospective, comparative</th>
<th>Level IV: Case series</th>
<th>Sample size (knees)</th>
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<th>Reason for TKA</th>
<th>Knee implant</th>
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**Abbreviations**
NR: not reported; OA: osteoarthritis; RA: rheumatoid arthritis; TKA: total knee arthroplasty
References


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