

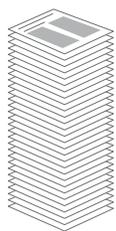
VISIONAIRE[◇]: More efficient for total knee arthroplasty (TKA) than conventional techniques

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:

Inclusion criteria:

- English-language paper
- Compared VISIONAIRE® to conventional instrumentation
- Reported on outcomes of interest

Exclusion criteria:

- Non-clinical study
- Repeats data set from another study

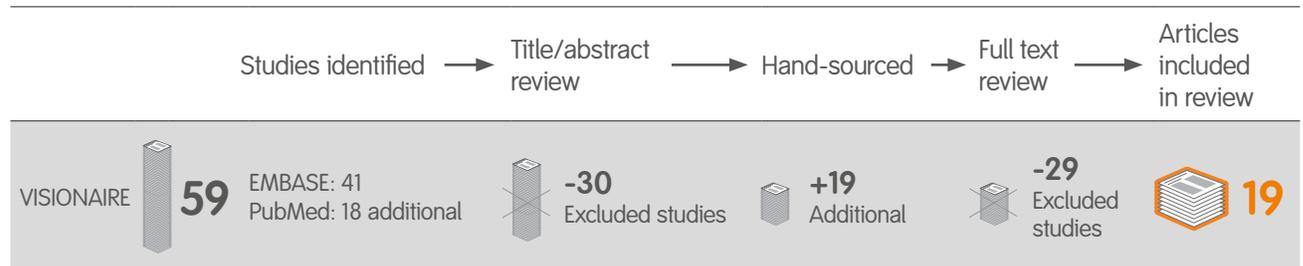


Figure 1. Search strategy

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

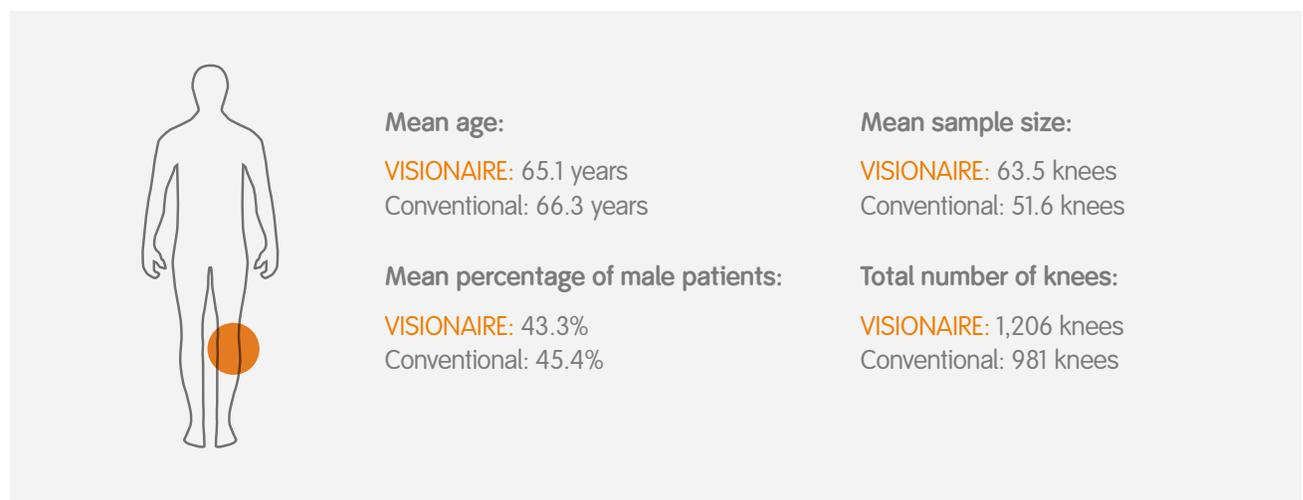


Figure 2. Study characteristics



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

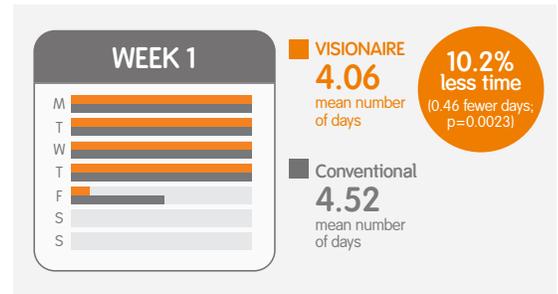


Figure 3. Comparison of mean number of days spent in hospital

Post-operative complications

- Four studies reported on post-operative complications^{2,5-7}
 - There was a 34% reduction in odds of post-operative complications with VISIONAIRE in comparison to conventional techniques, but this did not reach significance ($p=0.195$)

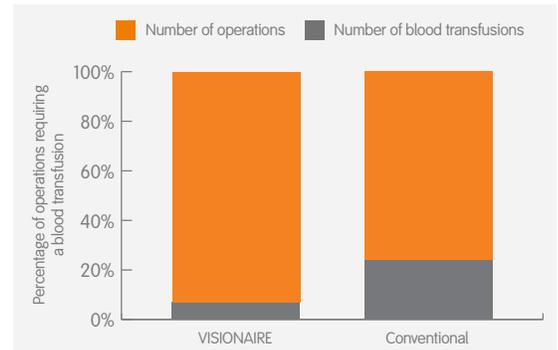


Figure 4. Percentage of operations requiring blood transfusions for VISIONAIRE and conventional techniques

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)

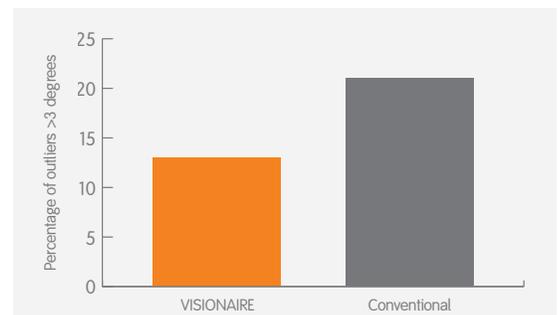


Figure 5. Percentage of outliers >3 degrees

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^{1-3,5,6,11,12,15-17}
 - VISIONAIRE[®] 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 time¹⁶
 - 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^{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.

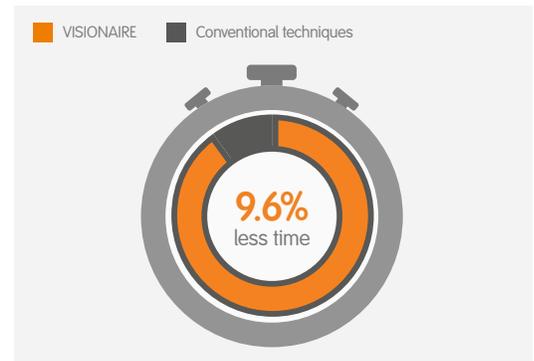


Figure 6. Percentage reduction in operating room time for VISIONAIRE compared to conventional techniques



Figure 7. Percentage reduction in operating room turnover time for VISIONAIRE compared to conventional techniques

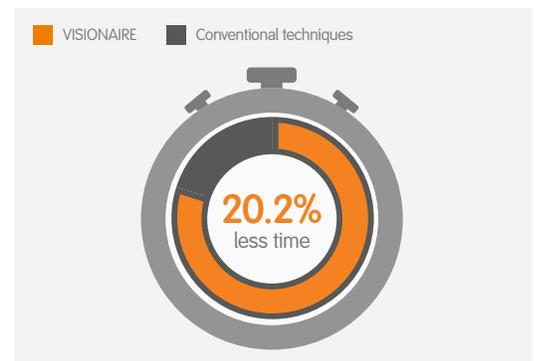


Figure 8. Percentage reduction in tourniquet time for VISIONAIRE compared to conventional techniques



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 time¹⁶
- VISIONAIRE improves patient outcomes:
 - Patients with VISIONAIRE TKAs have a 10% shorter stay in hospital¹⁻⁴
 - 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 1. Characteristics of included studies (n=19)

Study, year	Level I: Randomised controlled trials	Level II: Prospective, comparative	Level III: Retrospective, comparative	Level IV: Case series	Sample size (knees)	Mean age	% male	Reason for TKA	Knee implant
Abane et al, 2015 ⁹					59 (VISIONAIRE [®])	67.8	58.6	OA	GENESIS [®] II
					67 (conventional)	70.4	61.4	OA	GENESIS II
Huijbregts et al, 2016 ⁵					69 (VISIONAIRE)	66.7	42	RA/OA	GENESIS II/LEGION [®]
					64 (conventional)	69	50	RA/OA	GENESIS II/LEGION
Kosse et al, 2017 ⁶					21 (VISIONAIRE)	62.7	38.1	OA	GENESIS II
					21 (conventional)	63.4	57.1	OA	GENESIS II
Noble et al, 2012 ¹⁸					15 (VISIONAIRE)	65.4	53.3	NR	LEGION
					14 (conventional)	68	42.9	NR	LEGION
Pfitzner et al, 2014 ¹⁴					30 (VISIONAIRE)	65	46.7	OA	JOURNEY [®]
					30 (conventional)	64	43.3	OA	JOURNEY
Tammachote et al, 2018 ¹⁵					54 (VISIONAIRE)	72	22.2	OA/RA	GENESIS II
					54 (conventional)	72	27.8	OA/RA	GENESIS II
Vide et al, 2017 ³					47 (VISIONAIRE)	67.8	31.9	OA	Cemented fixed-bearing, cruciate-retaining implant
					48 (conventional)	69.3	31.3	OA	Cemented fixed-bearing, cruciate-retaining implant
Vundelinckx et al, 2013 ⁴					31 (VISIONAIRE)	64.7	48.4	NR	GENESIS II
					31 (conventional)	68.2	35.5	NR	GENESIS II
Bali et al, 2012 ¹⁰					6 (VISIONAIRE)	67.8	NR	OA	GENESIS II
					6 (conventional)	67.8	NR	OA	GENESIS II
Moubarak and Brillhault, 2014 ¹³					57 (VISIONAIRE)	NR	NR	No specific indication	GENESIS II/LEGION
					11 (conventional)	NR	NR	No specific indication	GENESIS II/LEGION
Nankivell et al, 2015 ¹⁷					41 (VISIONAIRE)	70.8	17.5	OA/RA/post-traumatic arthritis	GENESIS II
					45 (conventional)	71.4	40	OA/RA/post-traumatic arthritis	GENESIS II
Predescu et al, 2017 ⁸					40 (VISIONAIRE)	59.6	35	NR	GENESIS II
					40 (conventional)	62.4	30	NR	GENESIS II

Table 1. Characteristics of included studies (n=19) continued

Study, year	Level I: Randomised controlled trials Level II: Prospective, comparative Level III: Retrospective, comparative Level IV: Case series	Sample size (knees)	Mean age	% male	Reason for TKA	Knee implant
Barke et al, 2013 ¹		39 (VISIONAIRE®)	64	51.3	NR	GENESIS® II
		50 (conventional)	72.7	50	NR	GENESIS II
Daniilidis and Tibesku, 2014 ¹¹		170 (VISIONAIRE)	66.1	63.3	OA	GENESIS II
		160 (conventional)	65	50.6	OA	GENESIS II
Heyse and Tibesku, 2014 ¹⁹		46 (VISIONAIRE)	65.8	55.3	Degenerative joint disease	GENESIS II
		48 (conventional)	65.8	55.3	Degenerative joint disease	GENESIS II
Marimuthu et al, 2014 ¹²		115 (VISIONAIRE)	68.3	NR	NR	LEGION®
		185 (conventional)	67.6	NR	NR	LEGION
Myers et al, 2014 ²		30 (VISIONAIRE)	57	57.1	NR	LEGION
		29 (conventional)	55.4	45.8	NR	LEGION/JOURNEY®
Rathod et al, 2015 ⁷		30 (VISIONAIRE)	57	40	NR	LEGION
		28 (conventional)	59	42.9	NR	LEGION
DeHaan et al, 2014 ¹⁶		306 (VISIONAIRE)	62.8	31.8	Degenerative joint disease	LEGION/JOURNEY
		50 (conventional)	62.2	62.2	Degenerative joint disease	LEGION/JOURNEY

Abbreviations

NR: not reported; OA: osteoarthritis; RA: rheumatoid arthritis; TKA: total knee arthroplasty



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