NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Centre for Health Technology Evaluation

MTG Review Decision Document

Review of MTG39: iFuse for treating chronic sacroiliac joint pain

This guidance was issued in October 2018.

NICE proposes an amendment of published guidance if there are no changes to the technology, clinical environment or evidence base which are likely to result in a change to the recommendations. However the recommendations may need revision to correct any inaccuracies or to update to current formats. The decision to consult on an amendment of published guidance depends on the impact of the proposed amendments and on NICE's perception of their likely acceptance with stakeholders. NICE proposes an update of published guidance if the evidence base or clinical environment has changed to an extent that is likely to have a material effect on the recommendations in the existing guidance.

1. Recommendation

Amend the guidance to include iFuse-3D Implant and the new costs. The factual changes proposed have no material effect on the recommendations.

Do not consult on the review proposal.

Please see Appendix 1 for a list of the options and their explanations for consideration.

2. Original objective of guidance

To assess the case for adoption of iFuse for treating chronic sacroiliac joint pain.

3. Current guidance

1.1 The case for adopting the iFuse implant system to treat chronic sacroiliac joint pain is supported by the evidence. Using iFuse leads to improved pain relief, better quality of life and less disability compared with non-surgical management.

1.2 iFuse should be considered for use in people with a confirmed diagnosis of chronic sacroiliac joint pain (based on clinical assessment and a positive

response to a diagnostic injection of local anaesthetic in the sacroiliac joint) and whose pain is inadequately controlled by non-surgical management.

1.3 *Cost modelling indicates that after 8 years, using iFuse instead of non-surgical management will save the NHS around £129 per patient. It is likely that savings will then increase over time. Savings mainly come from fewer steroid joint injections and less pain relief medication with iFuse compared with non-surgical management*

4. Rationale

The original guidance (MTG39) focussed on the iFuse titanium plasma spray coated implant as there was no evidence on the 3D-printed implant at that time. iFuse-3D is a second-generation triangular porous implant that is very similar to the original iFuse Implant. The company said that the primary difference between the two implants was in the manufacturing process.

There is new clinical evidence since the original guidance including evidence on iFuse-3D. The external assessment centre (EAC) reviewed this evidence and advised that the iFuse-3D Implant is likely to be clinically equivalent to the original iFuse Implant. It concluded that the new evidence is consistent with the recommendations in MTG39.

For the cost case, the original cost model was updated to current prices of iFuse and comparators. The EAC costing update review found that iFuse is cost incurring for 1 to 2 years longer, before becoming cost saving. The EAC concluded that iFuse is likely to be cost saving over time, although it may take longer for it to become cost saving particularly if there has been a shift to using iFuse-3D. We therefore recommend that the guidance is amended to reflect these changes.

5. New evidence

The search strategy from the original assessment report was re-run. References from November 2017 onwards were reviewed. Additional searches of clinical trials registries were also carried out and relevant guidance from NICE and other professional bodies was reviewed to determine whether there have been any changes to the care pathways. The company was asked to submit all new literature references relevant to their technology along with updated costs and details of any changes to the technology itself or the CE marked indication for use for their technology. The results of the literature search are discussed in the 'Summary of evidence and implications for review' section below. See Appendix 2 for further details of ongoing and unpublished studies.

5.1 Technology availability and changes

iFuse is still available to the NHS. The company said the technology and its CE marking have not changed since original guidance. The iFuse system includes the original titanium plasma spray coated implant and the next generation 3D-printed implant. The primary difference between iFuse-3D and the original iFuse Implant is in the manufacturing process. The original implant is made from machined titanium bar stock with the porous surface coating applied as a titanium plasma spray. The iFuse-3D Implant is 3D-printed from titanium powder which allows for greater uniformity of the porous surface and fenestrations. MTG39 focussed on the titanium plasma spray coated implant as there was no evidence on the 3D-printed implant at that time. There is now evidence on iFuse-3D, so it has been included in this review along with the original implant. The company said the 3D-printed implant is now the most sold iFuse product.

The costs of the iFuse Implant system have increased since original guidance. iFuse with titanium plasma coated spray implants costs £4,122 per system (previously £3,920), which includes costs of implants, surgical accessories, pins, and drills. iFuse with 3D-printed implants costs £4,671.

5.2 Clinical practice

There have been no changes to the clinical pathway or NICE's interventional procedures guidance on minimally invasive sacroiliac joint fusion surgery for chronic sacroiliac pain since MTG39 (October 2018). Open surgery is still not considered to be a valid comparison in the NHS and therefore remains excluded.

Two clinical experts provided responses for the guidance review. They reported no substantial changes to the clinical pathway since the publication of MTG39. One expert highlighted the availability of a competing technology, Rialto SI Fusion system. The expert further reported that the biggest change has been use of the iFuse cages (known as 'iFuse bedrock technique'). The company indicated that this expanded indication is out of scope.

Another expert advised that the conservative management pathway for chronic sacroiliac pain is still not clearly defined or standardised. Combined physical and psychological approaches are often not tried or available. The other expert commented that some surgeons do not believe in sacroiliac joint pain despite the evidence. This expert advised that the British Spine Registry showed favourable outcomes after sacroiliac joint fusion. But there is risk that implants are misplaced and cause nerve damage. They advised that sacroiliac joint fusion should be done with x-ray guidance and cautioned that it

should not be done without computer navigation. Both experts thought MTG39 was useful guidance.

5.3 NICE facilitated research

None

5.4 New studies

Results from the NICE literature search (November 2017 to November 2021) as well as information from the company and clinical experts were used to assess new evidence. The EAC identified 11 publications relevant to this guidance review. These included:

- 1 systematic review and meta-analysis (Tran et al. 2019)
- 3 publications on the INSITE randomised controlled trial (RCT) and SIFI prospective single-arm study (Darr et al. 2018, Darr and Cher 2018, Whang et al. 2019)
- 3 publications on the SALLY prospective single-arm study on iFuse 3D (Patel et al. 2019, Patel et al. 2020, Patel et al. 2021)
- 1 RCT (Dengler et al. 2019), also reported in conference abstract (Dengler et al. 2018)
- 1 retrospective cohort study (Schmidt et al. 2021)
- 1 study protocol (Randers et al. 2021)

The evidence includes 8 publications on the original iFuse Implant and 3 on iFuse-3D. Follow-up data is reported from 6 months to 5 years. The EAC found that all studies were consistent with the evidence in the initial assessment report which reported improved outcomes for people after having surgery with iFuse. Details on the study design, population, and key results of each study are summarised below:

Systematic review and meta-analysis

Tran et al. (2019). Systematic review and meta-analysis comparing minimally invasive joint fusion with screw type surgeries including open surgical approaches. Fourteen publications reported using iFuse and 8 of these were included in the original assessment report. Results showed significantly better outcomes for people having sacroiliac joint fusion with iFuse. But 1 of the comparators (open surgery) is not considered a valid approach for NHS practice which means the review may have limited applicability.

Long Term Outcomes from INSITE and SIFI (LOIS)

Darr et al. (2018), Darr and Cher (2018), and Whang et al. (2019). LOIS reports long term outcomes combined from the INSITE and SIFI trials in

people who had sacroiliac joint fusion using iFuse. Outcomes are reported at year 3 (n=96, Darr et al. 2018), year 4 (n=93, Darr and Cher 2018), and year 5 (n=93, Whang et al. 2019).

Long-term follow-up results from the LOIS study indicate that improvements in pain, disability, and quality of life from baseline to year 2 (Duhon 2016, Polly 2016a) are maintained through years 3 to 5 (Table 1). The proportion of participants working full time decreased perioperatively but returned to preoperative levels by 6 months. Patient satisfaction was high throughout (Whang 2019).

Table 1. Long term outcomes from INSITE and SIFI

Outcome	Preoperative	3 years	5 years
Sacroiliac joint pain score	81.5 (SD 12.7)	26.2	27.1 (SD 29.4)
Oswestry Disability Index score	56.3 (SD 12.1)	28.0	29.9 (SD 21.2)
Quality of life	0.45 (SD 0.17)	-	0.75 (SD 0.22)
Opioid use	76.7%	47.4%	41.3%
Patient satisfaction		73% would definitely have procedure again	75% would definitely have procedure again

Study of Bone Growth in the Sacroiliac Joint after Minimally Invasive Surgery with Titanium Implants (SALLY)

Patel et al. (2019), Patel et al. (2020), and Patel et al. (2021) report 6, 12, and 24-month outcomes respectively from the SALLY study. SALLY is a prospective, single arm study in 51 people undergoing sacroiliac joint fusion using iFuse-3D Implant. Results show improvements in pain, disability, and quality of life from baseline to 6 months, with improvements maintained at 24 months (Table 2). Physical activity scores also showed significant improvements from baseline to 12 months. Authors concluded that sacroiliac joint fusion using iFuse-3D provided immediate and sustained benefits similar to those of trials using a predecessor device (presumed to be iFuse).

Table 2. Long term outcomes from SALLY

Outcome	Preoperative	6 months	24 months
Sacroiliac joint pain score	78.5	28.1	21.5
Oswestry Disability Index score	52.8	26.3	28.3
Quality of life	0.47	-	0.81
Opioid use	59%	21%	18%

Additional Studies

Dengler et al. (2019). Randomised controlled trial comparing sacroiliac joint fusion with iFuse with conservative management in 103 people with chronic SIJ pain. Low back pain improved significantly in the iFuse group (43.3 points) compared with the conservative management group (5.7 points, $p<0.0001$) with improvements maintained at 24-month follow-up. Oswestry Disability Index scores were also significantly improved in the iFuse group (26 points) compared with conservative management (8 points) at 24 months. Opioid use decreased from 56% at baseline to 33% at 24 months ($p=0.009$) for people who had sacroiliac joint fusion with iFuse, with no change observed in the conservative management group.

Schmidt et al. (2021). Retrospective cohort study in 19 people who underwent sacroiliac joint fusion using iFuse. Postoperative outcomes showed significant improvements in physical function scores (40 versus 55, $p=0.016$) and VAS scores (7 versus 3, $p=0.0001$). Role limitations due to physical and emotional health were also significantly improved.

5.5 Cost update

The EAC did a cost update for iFuse to reflect changes in the costs of the technology and comparator. Updated prices for iFuse were provided by the company, except for surgical accessories costs which the EAC inflated using the PSSRU index. Costs for iFuse were calculated separately for titanium plasma spray coated implants and 3D-printed implants. This assumes that the iFuse 3D-printed implant is clinically equivalent to the titanium plasma spray coated implants in the original model.

The cost update found that iFuse is cost incurring for longer, before becoming cost saving. iFuse with original titanium plasma spray coated implants is cost incurring up to 8 years (-£323) but becomes cost saving from year 9 (£230.37) onwards. When using the cost of the iFuse-3D Implant, it becomes cost saving from year 10 (£172.31). As there was uncertainty around the surgical accessories costs, the EAC did a sensitivity analysis on this input only. It found that varying the cost of surgical accessories ±20% did not alter the point at which iFuse became cost saving.

6. Summary of new information and implications for review

The new clinical evidence is consistent with the recommendations in the original guidance. The EAC concluded that the new evidence reported favourable outcomes associated with using iFuse which were maintained up to 5 years after surgery. Clinical evidence supports the assumption that iFuse-3D is clinically equivalent to the original spray coated implant. But the EAC noted that there are no studies comparing the iFuse-3D Implant with the standard iFuse Implant.

The updated cost modelling shows that iFuse is cost incurring for longer, before becoming cost saving. The EAC concluded that iFuse results in pain relief, less disability, reduction in opioid use, and improved quality of life. It considered that sacroiliac joint fusion using iFuse is safe with reports of device and procedure related adverse events rare. Based on its review, the EAC advised that no change was needed to recommendations 1.1 and 1.2 in MTG39. But recommendation 1.3 may need to be amended to reflect that iFuse may not become cost saving until 9 years after surgery.

7. Implementation

The company reported that iFuse is used in [redacted]
Between 2017 and 2021, iFuse was used in
[redacted].

8. Equality issues

NICE is committed to promoting equality of opportunity, eliminating unlawful discrimination and fostering good relations between people with particular protected characteristics and others.

No equality issues were identified in the original guidance or this review.

People with chronic sacroiliac joint pain or lower back pain lasting more than 1 year may be considered disabled under the Equality Act 2010, if the condition has a substantial and long-term negative effect on their ability to do normal daily activities. People may experience chronic sacroiliac joint pain following pregnancy and childbirth. Pregnancy and maternity are protected characteristics.

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Appendix 1 – explanation of options

If the published Medical Technologies Guidance needs updating NICE must select one of the options in the table below:

Options	**Consequences**	**Selected – 'Yes/No'**
Amend the guidance and consult on the review proposal	The guidance is amended but the factual changes proposed have no material effect on the recommendations.	No
Amend the guidance and do not consult on the review proposal	The guidance is amended but the factual changes proposed have no material effect on the recommendations.	Yes
Standard update of the guidance	A standard update of the Medical Technologies Guidance will be planned into NICE's work programme.	No
Update of the guidance within another piece of NICE guidance	The guidance is updated according to the processes and timetable of that programme.	No

If the published Medical Technologies Guidance does not need updating NICE must select one of the options in the table below:

Options	**Consequences**	**Selected – 'Yes/No'**
Transfer the guidance to the 'static guidance list'	The guidance remains valid and is designated as static guidance. Literature searches are carried out every 5 years to check whether any of the Medical Technologies Guidance on the static list should be flagged for review.	No
Defer the decision to review the guidance	NICE will reconsider whether a review is necessary at the specified date.	No
Withdraw the guidance	The Medical Technologies Guidance is no longer valid and is withdrawn.	No

Appendix 2 – supporting information

Relevant Institute work

Published

Minimally invasive sacroiliac joint fusion surgery for chronic sacroiliac pain (2017) NICE interventional procedures guidance IP578.

Low back pain and sciatica in over 16s: assessment and management (Last updated 2020) NICE guideline NG59.

Low back pain and sciatica in over 16s (2017) NICE quality standard QS155

In progress

None found.

Registered and unpublished trials

Trial name and registration number	Details
Sacroiliac Joint Fusion Versus Sham Operation for Treatment of Sacroiliac Joint Pain (SIFSO) Trial number: NCT03507049	Prospective, double blind randomised controlled trial comparing sacroiliac joint fusion with iFuse with sham surgery. Recruitment status: Recruiting (last updated September 2021) Estimated end date: April 2023 Estimated enrolment: 60 people Locations: Sweden and Norway
Motion Analysis in Sacroiliac Joint Dysfunction (MASSIF) Trial number: NCT04824534	Prospective cohort study in people with sacroiliac joint dysfunction undergoing sacroiliac joint fusion with iFuse. Recruitment status: Recruiting (last updated February 2022) Estimated end date: September 2022 Estimated enrolment: 30 people Location: Netherlands

Appendix 3 – changes to guidance

Table 1: proposed amendments to original guidance

Section of MTG	Original MTG	Proposed amendment
Page 1, 1.1	The case for adopting the iFuse implant system to treat chronic sacroiliac joint pain is supported by the evidence. Using iFuse leads to improved pain relief, better quality of life and less disability compared with non-surgical management.	iFuse implant system is recommended as an option for treating chronic sacroiliac joint pain. The evidence shows that using iFuse leads to improved pain relief, better quality of life and less disability compared with non-surgical management.
Page 1, 1.3	Cost modelling indicates that after 8 years, using iFuse instead of non-surgical management will save the NHS around £129 per patient. It is likely that savings will then increase over time. Savings mainly come from fewer steroid joint injections and less pain relief medication with iFuse compared with non-surgical management	(Move to rationale) **[2022]**
Page 1, rationale		**Why the committee made these recommendations** Chronic sacroiliac joint pain usually needs lifelong management. Standard care involves a stepped-care approach beginning with non-surgical management and progressing to more invasive procedures as needed, such as steroid injections and radiofrequency ablation. Sacroiliac joint fusion using a device like iFuse may be considered if the chronic pain continues. The iFuse Implant System includes the original iFuse titanium plasma spray coated implants and the second-generation 3D-printed implant. iFuse-3D is very similar to the original iFuse Implant. The company said that the primary difference between the two implants is in the manufacturing process. The original guidance assessed the original iFuse

		implants only because there was no evidence on the 3D-printed implant at that time. There is now evidence on both implants. It suggests that the iFuse-3D Implant is likely to be clinically equivalent to the original iFuse Implant. The evidence on iFuse showed that people who had surgery with iFuse reported greater improvements in pain scores, disability, and quality of life compared with non-surgical management. Long-term follow-up suggests that these improvements are maintained in the years following surgery. Cost modelling indicates that iFuse is initially cost incurring before becoming cost saving. At year 9, using iFuse with the original implants instead of non-surgical management will save the NHS around £230 per person. Using iFuse-3D will be cost incurring until year 10 when it becomes cost saving (£172 per patient). It is likely that savings will then increase over time. Savings mainly come from fewer steroid joint injections and less pain relief medication with iFuse compared with non-surgical management. **[2022]**
Page 2, 2.1	The iFuse implant system (SI-Bone) is a titanium implant intended for use in people with chronic sacroiliac joint pain. iFuse is placed across the sacroiliac joint using minimally invasive surgery, where it is intended to stabilise the joint and to correct any misalignment or weakness that can cause chronic pain. The implant is triangular, which is designed to limit movement and spread shear stresses evenly. It has a porous metal coating, which	The iFuse implant system (SI-Bone) is a titanium implant intended for use in people with chronic sacroiliac joint pain. iFuse is placed across the sacroiliac joint using minimally invasive surgery, where it is intended to stabilise the joint and to correct any misalignment or weakness that can cause chronic pain. The implant is triangular, which is designed to limit movement and spread shear stresses evenly. The original iFuse implant has a porous

	the company claims promotes bone-on-bone growth and encourages joint fusion.	metal coating, which the company claims promotes bone-on-bone growth and encourages joint fusion. There is also a second-generation 3D-printed implant (iFuse-3D) that is very similar to the original iFuse Implant. The company said that the primary difference between the two implants was in the manufacturing process. **[2022]**
Page 2, 2.2	The cost of iFuse stated in the company's submission is £4,059, which includes 3 implants and the necessary consumables for the procedure. The cost of theatre time is estimated to be £1,310 per procedure (using HRG code HN13A-F – Major hip procedures from NHS reference costs for 2015/16).	The cost of iFuse with the original implant is £4,122, which includes 3 implants and the necessary consumables for the procedure. iFuse with 3D-printed implants costs £4,671. Staff and hospital costs are estimated to be £1,455 per procedure (using HRG code HC53, 54, 60, 61, 62, 63, 64 – Elective, excess bed days for back pain interventions from NHS reference costs for 2015/16, inflated using PSSRU). **[2022]**
Page 4, 3	**Evidence**	**Evidence** This section summarises the evidence assessed in the original guidance for iFuse. All studies evaluated iFuse with titanium plasma spray coated implants. There is now evidence on iFuse-3D which suggests it may be clinically equivalent to the original iFuse implant. For a review of the new clinical evidence on iFuse including iFuse-3D, see the EAC evidence review report. **[2022]**
Page 5, 3.6		For the guidance review, the EAC revised the model to reflect 2022 costs. Costs for iFuse were calculated separately for titanium plasma spray coated implants and 3D-printed implants. Details of the parameter changes are in the EAC costing update report. Results for the 2022 updated model shows iFuse is cost incurring up to 8 years (-£323) however it becomes cost saving from year 9 (£230.37) onwards. When using the cost of the iFuse-3D implant, it becomes

		cost saving from year 10 (£172.31) onwards. **[2022]**
Page 6, 4	**Committee discussion**	**Committee discussion** The committee discussion (2018) was on iFuse with the original titanium plasma spray coated implants which is likely to be equivalent to iFuse-3D. **[2022]**
Page 11, 4.13		Results for the 2022 updated model shows iFuse is cost incurring up to 8 years (-£323) before becoming cost saving from year 9 (£230.37). iFuse-3D becomes cost saving from year 10 (£172.31) onwards. **[2022]**

References

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Patel V, Kovalsky D, Meyer SC, et al. (2019) Minimally invasive lateral transiliac sacroiliac joint fusion using 3D-printed triangular titanium implants. Medical Devices 12: 203-14.

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Randers EM, Gerdhem P, Dahl J, et al. (2021). The effect of minimally invasive sacroiliac joint fusion compared with sham operation: study protocol of a prospective double-blinded multicenter randomized controlled trial. Acta Orthopaedica 93: 75-81.

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