NICE National Institute for Health and Care Excellence

NICE guidance

Processed nerve allografts to repair peripheral nerve discontinuities

HealthTech guidance
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Your responsibility

This guidance represents the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take this guidance fully into account, and specifically any special arrangements relating to the introduction of new interventional procedures. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

All problems (adverse events) related to a medicine or medical device used for treatment or in a procedure should be reported to the Medicines and Healthcare products Regulatory Agency using the Yellow Card Scheme.

Commissioners and/or providers have a responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties. Providers should ensure that governance structures are in place to review, authorise and monitor the introduction of new devices and procedures.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Contents

This guidance replaces IPG597.

1 Recommendations

1.1 Current evidence on the safety and efficacy of processed nerve allografts to repair peripheral nerve discontinuities is adequate to support the use of this procedure for digital nerves provided that standard arrangements are in place for clinical governance, consent and audit.

1.2 The evidence on the safety of processed nerve allografts to repair peripheral nerve discontinuities in other sites raises no major safety concerns. However, current evidence on its efficacy in these sites is limited in quantity. Therefore, for indications other than digital nerve repair, this procedure should only be used with special arrangements for clinical governance, consent and audit or research.

1.3 Clinicians wishing to do processed nerve allografts to repair peripheral nerve discontinuities in sites other than the digital nerves should:

- Inform the clinical governance leads in their NHS trusts.
- Ensure that patients understand the uncertainty about the procedure's efficacy on mixed nerve repair and provide them with clear written information. In addition, the use of NICE's information for the public is recommended.
- Audit and review clinical outcomes of all patients having processed nerve allografts to repair peripheral nerve discontinuities (see NICE's interventional procedure outcomes audit tool).

1.4 This procedure should only be done by surgeons with training and experience in peripheral nerve repair.

1.5 Patient selection should take into consideration the site, type of nerve (motor, sensory, mixed) and the size of the defect.

1.6 NICE encourages further research into processed nerve allografts to repair

peripheral nerve discontinuities. This should include information on the type of nerve repaired, the anatomical site, the size of the defect, patient reported outcome measures, functional outcomes, time to recovery and long-term outcomes (12 months to 18 months).

2 Indications and current treatments

2.1 Peripheral nerve damage can be caused by trauma or surgery, and can lead to reduced sensation and mobility of the affected limb or region. If direct repair is not possible because the section of nerve discontinuity is too long, grafts or artificial nerve conduits can be used.

2.2 Autologous nerve grafting (using another nerve from the same patient) is used most frequently (usually using the sural nerve from the leg). However, this can be associated with donor site morbidity. Untreated allografts (using a nerve from a donor) have also been used. However, postoperative immunosuppressive treatment is needed with untreated allografts.

3 The procedure

3.1 Acellular processed nerve allografts are nerves from deceased human donors that have had their immunogenic components removed using tissue processing techniques. They are stored frozen until implantation and are available in different sizes. Immunosuppressive treatment is not needed.

3.2 The procedure is done under general anaesthesia. The injured nerve is exposed, and the nerve ends are cleared of necrotic tissues and resected to allow for tension-free alignment with the graft. The graft is sutured to the exposed nerve ends. After grafting, limb splinting may be needed for several weeks to allow optimal nerve regeneration. The typical length of an allograft implant is 1 cm to 3 cm.

3.3 The aim of the procedure is to bridge the peripheral nerve discontinuity to allow axonal regeneration and growth through the allograft towards the distal nerve.

4 Efficacy

This section describes efficacy outcomes from the published literature that the committee considered as part of the evidence about this procedure. For more detailed information on the evidence, see the interventional procedure overview.

4.1 In a randomised controlled trial (RCT) of 23 patients needing digital nerve repair comparing processed nerve allograft (PNA) with treated bovine graft at 12-month follow-up, static 2-point discrimination assessment (s2PD, which tests the ability to discern the difference between 1 and 2 static pressure points) was statistically significantly better in the PNA group (n=5) than the bovine graft group (n=7; 5±1 mm versus 8±5 mm, $p<0.05$). In the same study, moving 2-point discrimination assessment (m2PD) was not statistically significantly different between the PNA group and the bovine graft group (5±1 mm versus 7±5 mm, $p>0.05$) at 12-month follow-up. In a non-randomised comparative study of 153 patients needing digital nerve repair comparing PNA repair (n=72) with tension-free suture nerve repair (n=81), s2PD scores (excellent plus good, defined as the ability to distinguish between 2 static pressure points at a maximum distance of 15 mm) were not statistically significantly different between the PNA group (67% [48/72]) and the tension-free suture group (64% [52/81]) at 6-month follow-up ($p=0.749$). In a case series of 17 patients with digital nerve injuries treated by PNA grafting, s2PD was excellent or good in 78% (14/18) of digits repaired, at a mean follow-up of 15 months. In the RCT of 23 patients, Semmes–Weinstein monofilament test (testing of pressure threshold using a monofilament; range: 2.833=normal sensation to 6.650=residual sensation) was statistically significantly better in the PNA group than the treated bovine graft group (3.6±0.7 versus 4.4±1.4, $p<0.05$) at 12-month follow-up. In the same study, thermal sensation was totally improved from baseline at 12-month follow-up and not statistically significantly different between the treatment (PNA group: from 7% [1/14] to 100% [6/6] and bovine graft group: from 33% [3/9] to 100% [7/7]).

4.2 In a case series of 64 patients needing nerve repair in the upper extremity and treated by grafting using PNA, there was meaningful recovery in 75% (48/64) of all patients. Univariate analysis showed that distal sites of injuries have a statistically significantly higher likelihood of recovery than proximal upper limb sites (odds ratio [OR] 5.606, 95% confidence interval [CI] 1.663 to 18.903;

p<0.05). In the same study, discontinuities smaller than 30 mm had a statistically significantly greater likelihood of meaningful repair than those greater than 50 mm (OR 14.333, 95% CI 2.143 to 95.848; p<0.05). In a case series of 26 patients with lingual nerve and inferior alveolar nerve discontinuities treated by PNA grafting, meaningful sensory recovery was assessed using a neurosensory test improvement tool (ranging from normal=best, through mild, moderate and severe to complete=worse). At 12-month follow-up, neurosensory test improvement scores were normal in 52% (12/23), mild in 9% (2/23), moderate in 26% (6/23) and severe in 13% (3/23) of patients. In the same study, neurosensory improvement was reported in 86% (12/14) of patients with discontinuities 8 mm to 20 mm in length and 89% (8/9) of patients with discontinuities 30 mm to 70 mm in length.

4.3 In the RCT of 23 patients, disability of the arm, shoulder and hand score (DASH: 0=no disability, 100=most severe disability) was not statistically significantly different between the PNA group (5±6.5) and the bovine graft group (8±6.3) at 12-month follow-up (p=0.318).

4.4 In a case series of 108 patients needing nerve repair, there was no sensory recovery because of graft failure in 5% (4/76) of patients at last follow-up and surgical revision was needed.

4.5 In the RCT of 23 patients, at 12-month follow-up, pain measured using a visual analogue scale (VAS, 0=no pain, 10=extreme pain) had improved from baseline in both groups (PNA group: from 4.7±3.4 to 0.5±0.6; treated bovine graft: from 4.4±2.1 to 0.9±1.0) but there was no statistically significant difference between the groups (p=0.432). In another case series of 26 patients needing PNA after resection of neuromas of the foot and ankle, mean ordinal pain score (0=no pain to 10=worse pain) statistically significantly reduced from 7.5 points at baseline to 4.9 points at a mean 66-week follow-up (difference 2.6, range +2.0 to -8.0; p=0.016). In the same study, patient reported outcome measurement information system scores were used to assess the impact of pain on patients' behaviour and daily function (reported as T-scores with a population mean of 50 and a standard deviation of 10). Pain behaviour T-score decreased by 7.3 (range+2.0 to -22.0) from 63.0 at baseline (percentile decrease of 24%, p<0.003). Pain interference T-score decreased by 11.3 (range +2.0 to -27.0) from 68.0 at baseline (mean percentile change of 31%, p<0.003). In a case series of 17 patients with digital

nerve injury treated by grafting with PNA, pain (measured using a VAS: 0=no pain, 10=extreme pain) worsened in 1 patient (VAS score increased from 5 at baseline to 8 at 15-month follow).

4.6 In the non-randomised comparative study of 153 patients, difference in satisfaction rate was not statistically significantly different between the PNA group and the tension-free suture group (2.02%, 95% CI -6.07 to 10.87) at 6-month follow-up.

4.7 The specialist advisers listed key efficacy outcomes as re-innervation of target organs, nerve regeneration rate, clinical sensory and motor outcome scales, and patient reported outcomes.

5 Safety

This section describes safety outcomes from the published literature that the committee considered as part of the evidence about this procedure. For more detailed information on the evidence, see the interventional procedure overview.

5.1 Tenolysis was needed in 3% (2/78) of patients at 6-month follow-up in a non-randomised comparative study of 153 patients needing digital nerve repair comparing processed nerve allograft (PNA) repair (n=72) with tension-free suture nerve repair (n=81).

5.2 Neuroma was reported after 1 nerve repair of 132 nerves in a case series of 108 patients needing nerve repair.

5.3 Local infection that improved after treatment (not specified) was reported in 1 patient in a case series of 15 patients treated by PNA grafting.

5.4 In addition to safety outcomes reported in the literature, specialist advisers are asked about anecdotal adverse events (events which they have heard about) and about theoretical adverse events (events which they think might possibly occur, even if they have never done so). For this procedure, specialist advisers listed the following anecdotal adverse events: immunological reaction or rejection, and inflammatory reaction to preservatives. They considered that the following were theoretical adverse events: immunological reaction or rejection, inflammatory reaction to preservatives and sub-optimal results because of preference in using the allograft when patients could be treated by more established interventions.

6 Committee comments

6.1 The grafts used in this procedure are regulated by the Human Tissue Authority.

6.2 The grafts can be used in a variety of anatomical sites but most published evidence reviewed by the committee came from the repair of digital nerves.

6.3 The type of nerve being repaired (motor, sensory, mixed) and the size of the defect potentially affect the outcome.

6.4 The use of this type of graft avoids the need to harvest a donor nerve from the same patient, and avoids the use of non-human-derived tissue and immunosuppression.

7 Further information

7.1 Patient commentary was not sought because the procedure is only being done in research setting in the UK.

Update information

Minor changes after publication

January 2026: Interventional procedures guidance 597 has been migrated to HealthTech guidance 454. The recommendations and accompanying content remain unchanged.

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Endorsing organisation

This guidance has been endorsed by Healthcare Improvement Scotland.