NICE National Institute for Health and Care Excellence

NICE guidance

Placement of pectus bar for pectus excavatum (also known as MIRPE or the Nuss procedure)

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.

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This guidance replaces IPG3 and IPG310.

1 Recommendations

1.1 Current evidence on the safety and efficacy of placement of pectus bar for pectus excavatum (also known as MIRPE [minimally invasive repair of pectus excavatum] or the Nuss procedure) is adequate to support its use provided that normal arrangements are in place for clinical governance, consent and audit.

1.2 Placement of pectus bar for pectus excavatum should be carried out only by surgeons with cardiac and thoracic training and experience, who are capable of managing cardiac or liver injury, and where there are facilities for this.

1.3 This procedure should be carried out only by surgeons with specific training in inserting the device, and they should perform their initial procedures with an experienced mentor.

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2 The procedure

2.1 Indications and current treatments

2.1.1 Pectus excavatum is the most common congenital deformity of the sternum and anterior chest wall. The cosmetic disfigurement of pectus excavatum may sometimes be accompanied by impaired cardiac or respiratory function.

2.1.2 Surgery may be carried out in mid-to-late childhood, and includes open surgical repair involving subperichondrial resection of abnormal costal cartilages, transverse osteotomy and internal fixation of the sternum (the Ravitch procedure).

2.2 Outline of the procedure

2.2.1 Placement of pectus bar for pectus excavatum is carried out with the patient under general anaesthesia. The procedure is performed through several small incisions on either side of the chest, and is usually carried out under visualisation by thoracoscopy.

2.2.2 After subcutaneous tunnelling, a curved steel (pectus) bar is inserted behind the ribs and sternum with its concavity facing anteriorly. The bar is then rotated through 180 degrees using a 'flipper' device, so that its convexity faces anteriorly, pushing out the sternum and correcting the deformity. Sometimes two bars are used.

2.2.3 Various fixation techniques are used to keep the bars in place, including lateral stabilisers attached to the bars and ribs using wires and/or sutures.

2.3 Efficacy

Sections 2.3 and 2.4 describe efficacy and safety outcomes from the published literature that the Committee considered as part of the evidence about this procedure. For more

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detailed information on the evidence, see the overview.

2.3.1 Data from a UK register for 260 patients recorded cosmetic appearance scores preoperatively (on a scale from 1 [dislike] to 10 [like]) and postoperatively (from 1 [no change] to 10 [perfect]). Of 109 patients with preoperative scores and 119 patients with postoperative scores, the mean scores were 3.1 and 8.4, respectively (mean follow-up 369 days). A case series of 947 patients reported that of 521 patients who had the bar removed and had a follow-up of 2 years, 83% had an 'excellent' cosmetic result, 12% had a 'good' result, 2% had a 'fair' result (method of assessment not stated) and 2% had recurrence of pectus excavatum (absolute figures not stated; follow-up 1 to 15 years).

2.3.2 In a survey of 45 patients, the mean patient satisfaction score for postoperative appearance was 4.1 (±0.8; on a scale from 1 [very dissatisfied] to 5 [extremely satisfied]) at 54-month follow-up. The patients rated their self-esteem preoperatively as 6.3 (±1.2). This score improved to 7.9 (±0.8) after the procedure (on a scale from 1 [very dissatisfied] to 10 [extremely satisfied]; mean follow-up 54 months). When asked if they would have the operation again, the mean patient score was 9.1 (on a scale from 0 [no] to 10 [yes]).

2.3.3 In a survey of 43 patients who had either the Nuss procedure or the Ravitch procedure, there were no reported differences in health-related quality of life (assessed using the Child Health Questionnaire) or in physical and psychosocial quality of life (assessed using the Pectus Excavatum Evaluation Questionnaire) between the groups (mean follow-up 16 months).

2.3.4 The Specialist Advisers listed the key efficacy outcomes as cosmetic appearance and patient satisfaction.

2.4 Safety

2.4.1 In 2 case series of 167 and 172 patients, each reported 1 case of intraoperative liver perforation. In 2 case series of 167 and 322 patients, each reported 1 case of intraoperative cardiac perforation. A case report described cardiac injury during surgery in all 4 patients resulting in 1 death.

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2.4.2 The case series of 167 patients reported 15 cases of intraoperative rupture of the intercostal muscles (in older patients), 10 cases of haemothorax or haematopneumothorax and 7 cases of minor pericardial tears (follow-up not stated).

2.4.3 Data from the UK register reported perioperative adverse events in 9% (24 of 260) of patients and postoperative adverse events in 19% (49 of 260) of patients (follow-up 4 to 2477 days).

2.4.4 In 3 case series, bar displacements required surgical revision in 7% (50 of 668), 3% (11 of 322) and 2% (3 of 167) of patients, respectively (follow-up not stated).

2.4.5 In 4 case series and the UK register, pneumothorax occurred in 55% (369 of 668), 7% (24 of 322), 3% (5 of 172), 9% (15 of 167) and 2% (6 of 260) of patients, respectively.

2.4.6 The studies of 668, 322 and 172 patients reported pneumonia in 7, 3 and 3 patients; and pleural effusion in 5, 8 and 3 patients, respectively (follow-up not stated). The studies of 322 and 172 patients and the UK register data for 260 patients reported pericardial effusion in 8, 1 and 1 patients, respectively (timing of events not stated). In the study of 668 patients, pericarditis was reported in 6 patients (timing of event not stated). The UK register reported 1 case of perioperative lower lobe collapse and 1 case of persistent air leak.

2.4.7 The retrospective case series of 863 patients reported metal allergies in 2% (19 of 863) of patients.

2.4.8 The Specialist Advisers listed adverse events as injury to the lungs, heart, mammary artery and liver; pericarditis; pericardial effusion; bar migration; pleural effusion; pneumothorax; haemothorax; infection; osteochondrodystrophy; pain; metal allergy; and anaesthetic complications.

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Update information

Minor changes since publication

January 2026: Interventional procedures guidance 310 has been migrated to HealthTech guidance 199. The recommendations and accompanying content remain unchanged.

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Endorsing organisation

This guidance has been endorsed by Healthcare Improvement Scotland.

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