NICE National Institute for Health and Care Excellence

NICE guidance

Insertion of metal rib reinforcements to stabilise a flail chest wall

HealthTech guidance
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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 IPG361.

1 Recommendations

1.1 Current evidence on insertion of metal rib reinforcements to stabilise a flail chest wall is limited in quantity but consistently shows efficacy. In addition, there are no major safety concerns in the context of patients who have had severe trauma with impaired pulmonary function. Therefore, the procedure may be used provided that normal arrangements are in place for clinical governance, consent and audit.

1.2 Patient selection should be carried out by critical care specialists, chest physicians and thoracic surgeons with appropriate training and experience.

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2 The procedure

2.1 Indications and current treatments

2.1.1 Chest wall injury is common as a result of major blunt trauma (for example, motor vehicle accidents). It varies in severity from minor bruising or an isolated rib fracture, to severe crush injuries leading to respiratory compromise.

2.1.2 A flail chest occurs when a segment of the thoracic cage moves independently from the rest of the chest wall. A flail chest causes paradoxical movement of this segment of the chest wall – in-drawing on inspiration and moving outwards on expiration – and this segment of chest wall fails to contribute to lung expansion. Flail chest has been defined in a variety of ways, but at least 2 fractures per rib in at least 2 ribs are needed to produce a flail segment. Large flail segments may extend bilaterally or involve the sternum, and may compromise respiration sufficiently to require mechanical ventilation.

2.1.3 Management of chest wall injury is directed towards protecting the underlying lung, achieving adequate ventilation and oxygenation, and preventing infection. Analgesia sufficient to allow normal respiration and coughing may be adequate for mild cases. More severe cases require ventilatory support, and suction to remove mucus or secretions from the airways to prevent atelectasis.

2.2 Outline of the procedure

2.2.1 Surgical stabilisation with metal rib reinforcements aims to allow earlier weaning from ventilator support, reduce acute complications, and avoid chronic pain sometimes associated with permanent deformity of the chest wall.

2.2.2 With the patient under general anaesthesia, an incision is made over the rib fractures to be treated, and the fractured ribs are reduced. The affected ribs are stabilised using struts or metal plates, fixed with screws or intramedullary wires. These metal plates and screws are usually left in place in the long term.

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2.2.3 There are many variations in the materials and techniques used to stabilise flail chest with metal rib reinforcements. It should be noted that Kirschner wires, used alone, are not covered by this guidance.

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 detailed information on the evidence, see the overview.

2.3.1 A randomised controlled trial (RCT) of 37 patients treated by surgical stabilisation (n=18) or mechanical ventilation (n=19) reported a significantly lower proportion of patients with pneumonia at day 21 in the surgical stabilisation group compared with the mechanical ventilation group (22% [4 out of 18] versus 89% [17 out of 19]; $p<0.05$).

2.3.2 The RCT of 37 patients reported a mean critical care stay of 16.5 days in the surgical stabilisation group and 26.8 days in the mechanical ventilation group ($p<0.05$).

2.3.3 The RCT of 37 patients treated by surgical stabilisation (n=18) or mechanical ventilation (n=19) reported a mean percentage of forced vital capacity at 12 months of 96% and 80% respectively ($p<0.05$). A case series of 66 patients reported that 52% (26 out of 50) of patients had normal pulmonary function at 6-month follow-up.

2.3.4 The RCT of 37 patients reported that a significantly higher percentage of patients had returned to full-time employment at 6 months in the surgical group compared with the mechanical ventilation group (61% [11 out of 18] versus 5% [1 out of 19]; $p<0.01$).

2.3.5 The Specialist Advisers listed additional key efficacy outcomes as survival, duration of ventilation, long-term stabilisation of chest wall, reduced pain and patient satisfaction.

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2.4 Safety

2.4.1 Death was reported in 30% (3 out of 10) of patients with pulmonary contusion treated by surgical stabilisation in a non-randomised comparative study of 42 patients. Of these deaths, 2 were from massive haemorrhage and 1 was from sepsis with multi-organ failure. No deaths were reported in patients without pulmonary contusion who were treated by surgical stabilisation.

2.4.2 Persistent pain at the operative site was reported in 11% (6 out of 57) and 24% (5 out of 21) of patients in a case series of 66 patients at 6-month follow-up and a case series of 23 patients at 3-month follow-up respectively. This improved in 3 and 2 patients respectively after stabilisation plates and screws were removed at 6 months.

2.4.3 The Specialist Advisers considered theoretical adverse events to include migration of metalwork, fracture of stabilisers, lung injury from stabilisers, screw loosening or separation, infection and allergy.

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Update information

Minor changes since publication

January 2026: Interventional procedures guidance 361 has been migrated to HealthTech guidance 234. 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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