The diamond frame: a simple and reliable construct for damage control resuscitation for femoral and knee spanning external fixation

I Pallister, A Tong, N Vannet, S Atherton

Abertawe Bro Morgannwg University Health Board, UK

CORRESPONDENCE TO

Ian Pallister, E: ian.pallister@wales.nhs.uk

BACKGROUND

Emergency external fixation conveys the benefits of fracture stabilisation without the risks of major surgery in damage control resuscitation.¹ Swiftly assembled, simple, reliable constructs are paramount, especially in mass casualty situations² and for trainees given limited exposure to this situation.³

TECHNIQUE

Diamond frames are characterised by the application of parallel handlebars to control each side of the injury. For femoral fractures, the handlebars are at 45° to the axis of the femur. In spanning frames, handlebars are applied parallel to the femur and tibia. These bars must be long with significant overlap so that they may then be connected by a second pair of bars, thus creating a diamond.

Figure 1 Femoral shaft fracture in a polytrauma patient. 'Sounding' the femoral cortex using straight scissors to assure perpendicular pin placement. Final reduction achieved. Final diamond frame, showing pin placement in relation to muscle groups, handlebars, connecting bars and the synovial reflection of the knee (dotted line).

Near-far pin placement is used, drilling in 5mm self-drilling/tapping Schanz pins through the near cortex, then bracing by hand against the far cortex (lateral and anterolateral pins in femoral frames and anterolateral femoral pins with anteromedial tibial pins in spanning frames). Both the zone of injury and the synovial reflections of the knee must be avoided. This can be done by screening at the zone of injury using a C-arm and by inserting the distal femoral pin proximal to mid-patella level laterally or at least two fingerbreadths proximal to the upper pole for an anterolateral pin. The injury is reduced

Figure 2 Severe tibial plateau fracture: admission x-rays and computed tomography reconstructions of temporary reduction achieved. Final diamond frame, showing pin placement in relation to muscle groups, handlebars, connecting bars and the synovial reflection of the knee (dotted line).

with axial traction and manipulation of the fracture/knee injury using the handlebars. The C-arm is used to confirm the adequacy of reduction along with tactile feedback.

DISCUSSION

These stable diamond frames can be constructed with speed and minimal C-arm screening.

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Rectus sheath catheterisation: a novel method of placement

Bagenal J, Horsnell J, Loader J, West D

Weston Area Health NHS Trust, UK

CORRESPONDENCE TO

Jessamy Bagenal, E: jessamy.bagenal@gmail.com

BACKGROUND

The benefits of good postoperative pain relief are well established and are fundamental to enhanced recovery programmes.¹ This new method of inserting a rectus sheath catheter is quick and easy to perform at operation.

TECHNIQUE

Before closing the rectus sheath, it is held up with tissue forceps on one side. The epidural needle is inserted longitudinally at a 20° angle to the peritoneum. The surgeon is able to feel a pop as the Tuohy epidural needle enters into the space between the peritoneum and the posterior rectus sheath (Fig 1). An epidural catheter is then fed through the needle into this plane, where its position can be confirmed by palpation (Fig 2). The needle is removed, leaving approximately 5cm of the catheter in place.

The epidural needle is reinserted through the anterior abdominal wall into the abdominal cavity (Fig 3). The catheter is fed through the needle retrogradely (Fig 4) and brought out to the surface. The needle is removed by sliding it over the catheter, ensuring the end of the catheter remains in its position in the rectus sheath. A bacterial filter is attached to the catheter, flushed and fixed with dressings. Subsequently, 15ml of 0.25% bupivacaine local anaesthetic is injected through the catheter and given every 6 hours for 72 hours before removal of the catheter.

DISCUSSION

The use of rectus sheath blocks as an alternative method of analgesia is well described^{2,3} but has previously relied on ultrasonography guidance. This method of insertion is simple to learn and replicate, and has gained good patient feedback.

Figure 2 An epidural catheter is fed through the needle.

Figure 3 The epidural needle is reinserted into the abdominal cavity.

Figure 4 The catheter is fed into the needle retrogradely.

Figure 1 The epidural needle is inserted into the rectus sheath.

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