Surgical treatment and results of the fractures with medullary nailing

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In surgical treatment of fractures, intramedullary nailing is bridging the fracture by an intramedullary nail fixed with interlocking screws. Interlocking nailing has been widely accepted for femur, tibia, and humerus shaft fractures. Complications and technical failure remain a problem. Many studies have demonstrated that complications and the failure rate in intramedullary interlocking nailing are lower than other methods, such as plating or conservative treatments,[1] but some complications are technically challenging, such as stress on the distal screw, aseptic non-union of long bones with medullary canal reaming,[2,3] intramedullary infection,[4] and marrow fat extravasations, and fat embolism.

This is a prospective, cross-sectional multi-center study among 126 patients who had 153 fractures with an age range of 18-83 years (41 ± 15). The male to female ratio was 3.1:1. The operations were performed in Imam Khomainy General Hospital, Amir Mazandarani Hospital and Nimah Shaban Hospital in Sari City, Northern Iran, with multiple orthopedic surgeons. Skeletally matured patients were eligible for the study. We excluded patients who met one of the following criteria: 2 or more type 2 open fractures, medical contraindications to surgery and pathologic fractures.

Of 153 fractures, 4 (3%) cases (95% confidence interval [CI] of 0.01-0.03) had humerus closed proximal and middle third of shaft; 78 (51%) (95% CI 0.43-0.57) had tibia-fibula fractures including closed proximal, middle, distal third and segmental, comminuted, and open fractures type 1; 71 (46%) (CI 95% 0.36-0.53) had femoral fractures including closed, shaft, supracondylar and open fractures type 1. The surgical method used was interlocking medullary nailing (SIGN), without using a guide-wire during operation. Patients were evaluated at 2, 4, 6, 12, and then every 4 weeks for 6-9 months follow up after surgery. Delayed union was defined as radiographic persistence of a radiolucent line after 4 months, and infection was defined as fever, erythema, tenderness and discharge at the site of operation even with negative culture.

Of 153 cases, 21 (14%) had a type 1 open fracture, 3 femur fractures, and the others in the leg. The average diameter of the nail used for stabilization was 9 mm for tibia, 11 mm for femur, and 8 mm for humerus. Among all cases, we observed 2 delayed union after 4 months, treated by dynamization applied on both and fresh autogenously cancellous bone graft. on one of them. Both cases were closed fractures as follows: one with subtrochanteric fractured femur and the other had a distal third tibia fracture. The other complication was superficial infection which was detected 2 weeks postoperation in one patient with closed femoral fracture. Two cases had a closed tibia fracture, in which postoperation radiographic showed liner-non displaced proximal metaphyseal fracture of tibia that did not exist in the preoperation radiographic examination. Perhaps due to technical instrumentation. Other complication was respiratory distress in a male aged 68 ± 12 years old that was observed 20 hours after the operation (closed femoral shaft fracture treated with reamed medullary nailing) and recovered with 2 days respiratory support by an internist (fat embolism).

There have been many publications on intramedullary nailing and their complications, and this is a generally accepted technique for femoral–tibia-humerus bone fractures.[1] This is an effective method for achieving stable control of fractures, and it is technically easy to perform.[2] However, the failure rate and complications remain a problem. Pape et al[5] reported that fat embolization represents an added surgical impact, and can cause clinically relevant side effects if co-factors are present that set the individual up for post-complications. Join et al[6] reported that reamed intramedullary nailing causes an increase of intramedullary pressure and fat extravasations. They concluded that by using the rinsing suction reamer, this could reduce the side effect. Some studies reported that intramedullary nailing of femoral shaft fractures without reaming, results in a significantly higher rate of non-union compared with intramedullary nailing with reaming.[3,7] Paley and Herzenberg[4] reported intramedullary infections after nailing that were treated with antibiotic cement rods in 9 case. Failure of bone substance in the region of the interlocking screws is the most common complication in the treatment of osteoporotic bone. Intramedullary nailing is an accepted treatment for the fixation of long bone shaft fractures. There is a low but significant incidence of intraoperative complications during this procedure.

In this study, we conclude that the medullary nailing is an effective device for the treatment of long bone fractures with a high rate of union achieved and a low complication rate. We also presented a new complication, which was nondisplaced proximal metaphysic of tibia fracture during this procedure

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Anesthetic management of a morbidly obese patient using laryngeal mask airway

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Anesthesia for obese patients poses several unique challenges for the anesthesiologist. These are due to the problems of obesity itself, as well as the co-morbid conditions often associated with obesity. Difficulty in airway management is always expected during anesthesia for morbidly obese patients. In this case, laryngeal mask airway (LMA) was used to maintain airway during anesthesia for a morbidly obese patient.

A 46-year-old morbidly obese house wife (weight 118 kg, height 164 cm, body mass index 44 kg/m^2) was admitted to our hospital with severe pain and swelling in the right arm. Her medical history revealed that she is a known case of type II diabetes mellitus on oral hypoglycemic drugs, hypertensive since 10 years, with coronary artery disease, hepatitis C, and steroid dependent bronchial asthma. Two weeks before, she had a fall and her right shoulder was found to be dislocated. Under sedation, the dislocated arm was reduced and she was discharged. On examination, she was irritable, in distress with pain, looking pale without icterus, dehydrated and febrile with body temperature of 38.6^{O}C. Her blood pressure was 156/94 mm Hg, pulse rate 110/min, respiratory rate 20/min. Chest and cardiovascular system were otherwise normal. Abdomen was soft, lax, no tenderness, and no organomegaly. Local examination revealed a swelling in the right upper arm, 20 cm x 10 cm in size. Distal to the swelling the neurovascular examination was normal. A diagnosis of cellulites and intracompartmental pus collection was made. Hematology and blood biochemistry showed hypokalemia with potassium 2.6 mEq/liter, blood sugar of 376 mg/dl, albumin 2.5 gm/dl with abnormal elevations in serum transaminases (SGOT 88 and SGPT 160). Hemoglobin was 10.6 gm/dl and arterial blood gas showed partial arterial oxygen tension of 90 mm Hg and partial arterial carbon dioxide tension of 46 mm Hg on room air. Chest x-ray and ECG did not reveal any abnormal findings. The decision was made by the surgeons to explore the swelling. A 5% dextrose in normal saline was infused intravenously (IV). Blood sugar and serum potassium were controlled by regular insulin with sliding scale and the addition of potassium chloride 60 mEq/liter. Cefuroxime 750 mg, albumin 20% 100 gm, vitamin K 10 mg, Zantac 150 mg and methyl prednisolone 20 mg were given IV. Airway evaluation showed bull neck, limited mouth opening, jaw subluxation of +2 mm with effort, Mallampati class IV, and limited head extension. The cricothyroid membrane could not be identified. Difficult intubation was assumed.

Preoperative management. She was kept on nil per mouth for 8 hours. Initially, ventolin 2.5 mg (Atrovent 0.25) nebulizer with methyl prednisolone 20 mg IV was given. No sedation was given preoperatively. Ondansetron 4 mg IV and ranitidine 50 mg IV were given. She was hydrated with IV fluids. The immediate preinduction blood sugar was 145 mg/dl and serum potassium 4 mEq/ liter.

Anesthetic management. She was taken to the operating room with oxygen by face mask 6 L/min. In the operating room continuous ECG, oxyhemoglobin saturation (SpO_2), end-tidal carbon dioxide ($ETCO_2$) and invasive blood pressure were established.

Arterial line was secured in the left redial artery under local anesthesia after assuring the collateral ulnar circulation (Allen test). The operation table was kept slightly in anti-Trendelenburg position. Assuming the difficulties in airway management, it was decided to manage airway under spontaneous ventilation by using classical LMA. After preoxygenation, anesthesia was induced by fentanyl 1.0 μg/kg IV and propofol 240 mg given slowly in incremental doses to avoid apnea and fall in blood pressure. She was ventilated by mask with oxygen, nitrous oxide, and sevoflurane. Sevoflurane was increased to 3% slowly. When she was fully induced, sevoflurane was decreased to 2% after full inhibition of gag reflex, a size 3 LMA was introduced and connected to the circuit. Following induction, blood pressure dropped from 140/92 mm Hg to 78/42 mm Hg, which responded to rapid infusion of Hartman solution 500 ml. The surgeons were allowed to start operation. Twenty minutes later, shallow respiration was noted with drop in oxygen saturation from 98-99% at beginning of anesthesia, to 88-90%. She was ventilated manually with 100% oxygen. However, there was a significant increase in intrathoracic pressure, considering the history of bronchial asthma, to avoid bronchospasm; 50 ml propofol and 100 microgram fentanyl were given IV. After 2 minutes, a marked decrease in airway pressure was noted, and oxygen saturation reached 98-99% again. Anesthesia was maintained with 60% nitrous oxide in oxygen and sevoflurane 2-2.5% with supplemental doses of fentanyl. The patient's ventilation was assisted to maintain an end tidal carbon dioxide (PCO_2) at 5-6 kPa. The peak inflation pressure was not allowed to increase greater than 25 cm H_2O. The total duration of operation was 2 hours, and nearly 400 ml pus with blood was drained. A total of 2.5 liters of fluid were given. After the end of surgery, anesthesia was discontinued. The LMA was not removed until she was fully conscious. She was oxygenated by face mask. Arterial line was removed. The ECG monitoring and oxygenation were continued for 24 hours with oxygen saturation monitoring. Preoperative and postoperative insulin infusion on sliding scale was continued with strict monitoring of blood sugar. An above-knee graduated elastic compression stockings was used in the perioperative period to prevent deep vein thrombosis. Analgesia was provided by patient controlled analgesia (PCA) pump for 48 hours using pethidine. She was discharged from the hospital on the sixth postoperative day on her usual medications and oral antibiotics.

A careful and detailed assessment of the morbidly obese patient's upper airway is required before they are anesthetized. Assuming difficulty in airway management in our patient, we decided to keep her spontaneously ventilated with LMA and all precautions were taken to avoid regurgitation and aspiration. Although LMA does not provide a secure airway and is classically contraindicated in morbidly obese patients, it can be positioned easily without direct visualization or neuromuscular blocking agents. In comparison to endotracheal tube, insertion of LMA causes minimal cardiovascular response and is better tolerated at a lighter plane of anesthesia. The newly developed ProSeal laryngeal mask airway (PLMA) (Intravent Orthofix, Maidenhead, United Kingdom) is designed to facilitate controlled ventilation and enable separation of the respiratory and gastrointestinal tracts and may be a better choice in this case.[1] All seriously ill obese patients (in the emergency setting) should have supplemental oxygen regardless of room air SpO_2, until the situation is clear. All obese patients with airway problems or impending intubation, should have 100% preoxygenation to de-nitrogenate their tissues. All morbidly obese patients should receive prophylaxis against acid aspiration, even if they do not declare any symptoms of heartburn or reflux.[2] A combination of an H2-blocker (ranitidine 150 mg orally) given 12 hours and 2 hours before surgery will reduce the risk of aspiration pneumonitis. Some anesthesiologists also advocate giving 30 ml of 0.3 M sodium citrate immediately before induction, as an extra precaution. The use of a prokinetic drug, for example, metoclopramide 10 mg IV may be useful. Most of the patient's usual medications, such as cardiovascular drugs and steroids, should be continued. Obesity is an important risk factor for type II diabetes mellitus. For diabetic patients, a dextrose–insulin regimen will be required for all procedures. Preoperatively, continuous IV infusion of insulin is a better option than an intermittent subcutaneous bolus regimen.[3] Intravenous access may be a problem due to excessive subcutaneous tissue. Many anesthesiologists would advocate establishing a central venous line, but this in itself can be difficult. The use of portable ultrasound equipment may improve success. Propofol has 10 times more metabolic clearance than thiopentone, and is associated with less postoperative nausea and vomiting. Obese patients may be more susceptible to the effects of altered hepatic metabolism of volatile agents. Concentrations of inorganic free fluoride ions are higher in obese patients following exposure to halothane or enflurane, increasing the risk of nephrotoxicity. This does not appear to be the case with sevoflurane, despite its significant hepatic metabolism.[4] The use of opioid analgesics may be hazardous in the obese. A PCA system is probably the best option. A PCA has been shown to provide

effective analgesia in the obese, although respiratory depression has been reported.[5] Doses should be based on lean body mass**.** We did not use morphine in PCA, as morphine causes histamine release and this may exacerbate bronchial asthma. The PCA is also useful to control opioid when there is liver derangement. Supplemental oxygen and close observation, including pulse oximetry monitoring, are recommended. The risk of deep vein thrombosis in obese patients undergoing major surgeries is approximately twice that of lean patients, with a similar increase risk of pulmonary embolism. Measures to prevent venous thromboembolism should always be taken.

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