Introduction

Anesthetic management of hip surgery varies according to the complexity of the surgery, complications that may rise during the surgery, and the medical status of the patient. Complex procedures such as those involving acetabular bone grafting, insertion of a long-stem femoral prosthesis, removal of a prosthesis, revision surgery, or surgery in patients with acetabular protrusion (which entails a risk of entering the pelvic cavity or iliac vessels, or both) complicate the management of the anesthetic **(Parker, et al, 2002)**.

The anesthesiologist's preoperative assessment is crucial to the formulation and execution of the anesthetic plan. The patient must be evaluated for pre-existing medical problems, previous anesthetic complications, potential airway difficulties, and considerations relating to intraoperative positioning. This evaluation, coupled with an appreciation of the surgeon's needs, is used to formulate the anesthetic plan **(Urwin, et al, 2000)**.

In most cases, the choice of regional or general anesthesia in hip surgery depends on some or all of the following factors: patient's preference, state of health of the patient, expertise of the anesthesiologist, duration of the procedure, surgeon's preference, and practice pattern in the hospital. In general, most hip procedures can be performed using regional anesthesia alone with light sedation. More complicated operations may be performed using general anesthesia alone **(Parker, et al, 2002 and Urwin, et al, 2000)**. There are many potential benefits for the intraoperative use of neuraxial (spinal, epidural) anesthesia, including a decrease in mortality **(Rodgers, et al, 2000)** and major morbidity **(Rigg, et al, 2002 and Beattie, et al, 2001 and Ballantyne, et al, 1998 and Park, et al, 2001)**. Alternatively, combined techniques using continuous regional anesthesia (e.g., lumbar epidural) supplemented with light general anesthesia using a laryngeal mask airway may be particularly useful, incorporating many of the benefits of regional anesthesia with a sedated patient and a secured airway **(Dyer, et al, 1995)**.

Patients are placed in a variety of positions for hip procedures. The lateral decubitus position is frequently used to facilitate surgical exposure for hip arthroplasty, whereas the fracture table is often used for repair of femur fractures **(Urwin, et al, 2000)**.

Because most candidates for hip surgery have only a limited ability to exercise, their cardiopulmonary function can be difficult to assess. This often-elderly population frequently has underlying systemic diseases. Fluid administration must be carefully managed during this type of

extensive surgery. There is an increased likelihood of developing hypoxemia or pulmonary edema, or both, because of pulmonary endothelial injury from fat or bone marrow emboli **(Dyson, et al, 1988)** and from ventilation-perfusion mismatching. It is therefore reasonable to use invasive hemodynamic monitoring perioperatively in the elderly or medically compromised patient undergoing major hip surgery **(Pittman, et al, 2004)**.

Major hip procedures are associated with significant blood loss **(Lemos, et al, 1996)**. A plan to minimize homologous transfusion should be established. This may begin with predonation of autologous blood **(Thomas, et al, 1996)**, preoperative erythropoietin **(Faris, et al, 1996)** (e.g., in Jehovah's Witnesses **(Sparling, et al, 1996)** or patients with preoperative anemia), intraoperative hemodilution **(Mielke, et al, 1997 and Gillon, et al, 1996)**, induced hypotension **(Sharrock, et al, 1991)**, conduction anaesthesia, use of a cell saver **(Desmond, et al, 1996 and Borghi, et al, 1997)**, preservation of normothermia **(Schmied, et al, 1996)**, or by tolerating lower hematocrit values postoperatively (i.e., lowering the so-called transfusion trigger **(Practice Guidelines for Blood Component Therapy, 1996))** and the use of antifibrinolytic agents **(Capdevila, et al, 1998 and Hippala, et al, 1997)**.

Methyl methacrylate is an acrylic bone cement used during arthroplastic procedures. Insertion of this cement is associated with sudden onset of hypotension in some patients. This hypotension has been attributed to absorption of the volatile monomer of methyl methacrylate, embolization of air and bone marrow during femoral reaming, lysis of blood cells and marrow induced by the exothermic reaction**(Hassan and Fahy, 2005)**, and conversion of methyl methacrylate to methacrylate acid. Adequate hydration and maximizing inspired oxygen concentration minimize the hypotension and hypoxemia that can accompany cementing of the prosthesis. Because air can be entrained during this procedure, nitrous oxide should be discontinued several minutes before this point **(Kuehn, et al, 2005)**.

Fat embolus syndrome (FES) is associated with multiple traumatic injuries and surgery involving long bone fractures. Risk factors include male sex, age (20–30 years), hypovolemic shock, intramedullary instrumentation, rheumatoid arthritis, total hip arthroplasty using the technique of cementing femoral stems designed for press-fit application, and bilateral total knee surgery. The incidence of FES in isolated long bone fractures is 3–4%, and the mortality rate associated with this condition is significant, ranging from 10 to 20% **(Carr, 1990)**.

Venous thromboembolism is a major cause of death after surgery or trauma to the lower extremities. Without prophylaxis, venous thrombosis develops in 40–80% of orthopaedic patients, and 1–24% show clinical or laboratory evidence of pulmonary embolism. Fatal pulmonary embolism occurs in 0.2–13% of patients. The incidence of fatal pulmonary embolism is highest in patients who have undergone surgery for hip fracture **(Rosencher, et al, 2005)**.

Effective postoperative analgesia with epidural infusions or peripheral blockade reduces narcotic requirements, provides better analgesia, reduces catabolism, and results in improved rates of rehabilitation after hip surgery. To optimize the potential advantage of the analgesia, early rehabilitation should be encouraged **(Viscusi, et al, 2005 and Foss, et al, 2005)**.