**Introduction:** The pathophysiology of fat embolism syndrome (FES) has not been completely elucidated. Pulmonary fat embolism, a sub clinical event, occurs in most multiple trauma patients who sustain long bone fractures. On occasion, the patient will develop FES which can result in respiratory distress and become fatal. In addition to the injury itself (i.e. long bone fracture), surgical intervention has also been implicated as a cause of FES. This becomes especially important in the trauma patient who often presents with hemorrhagic shock. The two-hit theory states that sequential insults of hemorrhagic shock, resuscitation, and fat embolism leads to greater pulmonary injury than either event alone. Intramedullary reaming can increase intramedullary pressure and thereby cause fat globules to enter the systemic circulation. The Reamer Irrigator Aspirator (RIA) can potentially decrease the fat embolic load through its simultaneous irrigation and aspiration mechanism. The objective of this study was to investigate the effects of the RIA on fat embolism outcome, as compared to the standard AO reamer, utilizing physiologic parameters as outcome measures.

**Methods:** All animal procedures were approved and performed in accordance with the Animal Care Committee at St. Michael’s hospital. Following anesthetic administration, the following procedures were performed on seventeen porcine animals. An IV catheter was inserted in the marginal ear vein for fluid balance and drug administration. Each pig was intubated and mechanically ventilated. The left jugular vein was cannulated to allow a swan-ganz catheter to measure pulmonary artery pressure (PAP). The left carotid artery was cannulated for measuring mean arterial pressure (MAP) and blood sampling. The animals were stabilized during a 30 minute period. During this time, a blood gas sample was taken to ensure proper ventilation and ideal animal baseline condition (PaCO2 between 35-40 mm Hg) was achieved. Subsequently, one third of the pig’s blood volume was withdrawn to simulate hemorrhagic shock. The volume of blood loss was calculated based on each pig’s weight. Each animal was kept in a state of hypovolemia and therefore less fat are displaced into the systemic circulation.

**Discussion:** Physiologic changes during fat embolism have been well documented in the literature. Using established physiologic parameters, there appears to be a difference between the RIA reamer group. The results of this experiment suggest that the RIA may be beneficial with respect to fat embolism outcome. With the simultaneous irrigation and aspiration mechanism of the RIA, intramedullary fat content may be diminished during reaming and therefore less fat are displace into the systemic circulation.

**References:**

Refer to the references in the text for the complete list.

**Results:** There was one intraoperative death in the AO reamer group. This animal expired after cement pressurization associated with profound hypotension, pulmonary hypertension and eventual cardiac arrest. This animal was excluded from the statistical analysis. With respect to the rest of the animals, there was a statistically significant difference for PaO2 (P = 0.004), cardiac output (P = 0.002), and PAP (P = 0.005) between the AO and RIA groups. That is, by the completion of the experiment the RIA group had higher PaO2, lower PAP, and higher cardiac output measurements as compared to the AO group. There was no statistical significance between the two groups with respect to MAP (P = 0.468).

**52nd Annual Meeting of the Orthopaedic Research Society**

**Paper No: 0434**