

may be found elsewhere <sup>6</sup>. In short, each system consists of a console containing of a viewing system and manipulating devices from which multi-joined robotic arms can be controlled. These arms may be mounted on the operating table (Zeus) or on a separate mobile surgical cart (da Vinci). Special laparoscopic surgical instruments with “wrists” providing six or more degrees of freedom of movement are brought into the body cavity and connected to the robotic arms. Potential advantages over conventional endoscopic surgery are the improved ergonomics and increased dexterity enabling “regular” surgeons to perform complex surgical tasks such as performance of vascular anastomoses with relatively short learning curves. Despite tremendous interest in the subject displayed at vascular meetings, a medline search produces very little information on the use of robotic technology in the field of vascular surgery. Clinical vascular experience with robotics has been limited to an incidental case report <sup>7</sup>, whereas other fields such as cardiac, pediatric, urologic and gastrointestinal surgery <sup>8</sup> have produced an abundance of literature, beyond the scope of this presentation.

## Experimental work

The aim of our experimental study was to assess the safety and efficacy of a robot-assisted laparoscopic interposition graft of the abdominal aorta in pigs and to compare this to the standard laparoscopic approach <sup>9</sup>.

## Methods

Towards this goal, twenty laparoscopic aorta-tube interposition prostheses were sutured in an end-to-end fashion through a retroperitoneal approach, ten using the da Vinci robot system and ten using laparoscopic suture techniques. Operative-time, divided in separate time-frames, blood loss and complications were registered preoperatively. Blood loss after clamp removal was scored separately. Efficacy of the anastomoses was evaluated by measuring flow after the procedure (by inspection of the distal aorta and palpation of the femoral artery) and by measuring passage, circumference and number of stitches.

## Results

Total operative-time (skin-to-skin) was 164 (116-225) minutes in the robot-assisted group vs. 280 minutes in controls (178-244). Proximal anastomosis time was 22 minutes (15-37, robot) vs. 40 (31-75), distal anastomosis time was 22 (14-40) vs. 41 minutes (28-46, controls). No intraoperative complications occurred in the robot-assisted group. In the control group, the vena cava was injured in one case and subsequently tamponated before continuing the procedure. At autopsy, all robot-assisted anastomoses were macroscopically adequate. In the control group, a large distance (>3 mm) between two stitches was measured in 10 cases. This study demonstrated the efficacy and safety of robot-assisted laparoscopic aortic graft interposition. The procedure could be performed faster, with fewer complications and lower blood-loss with robotic assistance than through a standard laparoscopic approach.