Aorto-Iliac Bypass Technique in Pigs

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Abstract. Aorto-iliac bypass can be used in all situations of aorta artery and/or iliac artery occlusion. This is done with synthetic vascular prostheses. The polyethylene terephthalate (Dacron) vascular prostheses and expanded polytetrafluorethylene vascular prostheses are the most used in human medicine.

The conducted research during 2008-2009 in Surgery Clinic of Veterinary Medicine Faculty from Cluj-Napoca aimed achievement of the aorto-iliac bypass in 6 pigs. It was used Dacron vascular prostheses and Prolene 4-0 suture threads. Vascular prostheses have been precoagulated and both ends tailored before implantation. The animals were anaesthetized through gas narcosis with Isoflurane. The surgery technique involves white line laparatomy, aorta artery and iliac arteries identification and isolation and achievement of end-to-side anastomoses between both prosthesis and aorta artery, prosthesis and external iliac artery respectively. Antibiotics were administrated five days after surgery.

During 30 days animals were monitored, period in which no change of the followed parameters was recorded.

Keywords: bypass, Dacron, aorta artery, pigs

INTRODUCTION

In different clinical situations that sell off with the artery occlusion in the aorta and iliac arteries (atheromatous plate formation, tumoral processes that concerns the vascular wall, etc.), the surgical treatment is the only one able to achieve sustainable and permanent resumption of the arterial flow. In human medicine are used synthetic vascular prostheses that are able to replace the arterial occlusive segment. These prostheses have to be well tolerated by the host, to have the surface that comes into contact with the blood nonthrombogenic, to do not allow the loss of blood through the interstitial and not to degrade with time. So far, the best results have been offered by the polyethylene terephthalate (Dacron) and the expanded polytetrafluorethylene (ePTFE) vascular prostheses.

This study had as purpose the technique of the aortoiliac bypass in pig implementation and the vascular prosthesis performance evaluation for a period of 30 days post surgical.

MATERIALS AND METHODS

Researches were conducted in the Surgery Clinic of the Faculty of Veterinary Medicine from Cluj-Napoca, during 2008-2009, on a number of 6 animals of swine species, with weight between 50 and 70 kg.

Were used polyethylene terephthalate synthetic vascular prostheses (Dacron), pleated and braided, and in the sutures were used nonresolvable monofilament synthetic yarn Prolene 4-0. Threads of suture used in vascular surgery are provided with nontraumatic curved needles attached at the both ends.
The used surgical instruments were both classical and specifically for vascular surgery, including the dissection pleats, clips for vascular clamping and scissors for arteriotomy. Before the surgery, the subjects were kept on diet food for 24 hours. 30 minutes before the start of operation were given Atropine 0.2 ml sc followed by administration of Diazepam in dose of 2 mg / kg body weight intravenous and Ketamine 2 mg / kg body weight. After placing the endotracheal tube, the anesthesia was achieved by gaseous narcosis with Isoflurane.

Intraoperative, the animals were heparinized with heparin serum by intravenous administration through a cannula inserted in the external auricular vein, and post surgical, the animals were heparinized daily with serum heparin administrated i.m., 30 IU heparin / kg body weight.

The abdominal region of the animals was prepared by hair cutting, shaving and chemical antisepsis, and then they were placed in dorsal position. After local infiltration with Adrenaline and Alphacaine, was practiced the skin and underlying layers of the white line incision, starting in the subxiphoidiane region till the prepubian area. The penetration into the abdominal cavity through the parietal peritoneal incision and isolation of the organs using fields followed, so that to be able to identify the infrarenal portion of the aorta artery and its terminals. Retroperitoneal incision was made in order to allow the isolation of aorta artery and iliac arteries.

It wasn’t necessary to ligature the small mesenteric trunk and lumbar collateral artery because we clamped the aorta with a Satinski clip that allows partial blockage of the vessel, under the working area existing blood flow.

For the prosthesis of Dacron precoagulation, were harvested approximately 10 ml of blood that was then passed through the prosthesis to the total closure of the pores.
After clamping the aorta artery with Satinski clip, linear arteriotomy was practiced in the direction of the long axis of the artery on a length of 1.5-2 cm.

Vascular prosthesis heads were tailored so that the angle between the native vessel and prosthesis to be between 30-40 degrees and the guideline to be over. End-to-side anastomosis between artery and prosthesis always starts from the axilla of prosthesis. The suture was performed in continuously wire with the distance between the suture steps of 1-2 mm with one of the ends of suture thread perform a few steps in a sense, and then continue with the other end of the thread in opposite sense till the two ends meet. Multiple nodes are practice between the two ends of the suture thread (5-6 knots) to prevent slipping and their disposal. The node should always be placed on one of the side of the anastomosis.

After the proximal anastomosis is finished, a vascular clamp is placed near distal end of the prosthesis and aorta artery is slowly and progressively declamped to observe any bleeding that may arise between the suture points.
External iliac artery was immediately after its issuance ligatured, and was distal isolated and clamped. Has been practiced linear arteriotomy on the long axis direction at its level, too.

End-to-side anastomosis technique was performed by previously described. After the anastomoses are done, the vascular clamps removed slowly and gradually, observing any bleeding that may occur on the suture line and the resumption of blood circulation by pulse wave appearance.
Followed the retroperitoneal suture in continuous thread, and then closing the abdominal wall by suture block of peritoneal parietal muscles in the continuous thread and subcutaneous connective tissue and skin in separate points with silk. In the first 5 days post operative were given antibiotics and PenStrep 1 ml/10 Kg b.w. intramuscularly.

**RESULTS AND DISCUSSION**

Aorto-iliac bypass was performed with good results in pigs, the technique ensuring adequate blood flow through the iliac artery. During the surgical labors have been no accidents. The suture was watertight, no bleeding at the suture line after the vascular clips removal.

All animals survived surgery and the operator average was about two hours. Physiological constants were monitored both during operation and following days. Thus during the surgery was a slight tachycardia, internal temperature and respiratory frequency remaining in physiological limits. In the days following, the frequency of cardiac and
respiratory rate were maintained within the physiological, while the temperature varied as subfebrility in the first two days post operative, and then returning to physiological limits.

Vascular prostheses were evaluated by daily clinical examination of the animals for 30 days. Thus have watched the color of the integument changes, local temperature changes, the muscle mass of the region changes compared with the congener region, local changes of sensitivity and local deficiencies in motrice. No changes were observed in case of any parameters followed in 30 days of observations.

CONCLUSIONS

1. Aorto-iliac bypass can be achieved with good results in pigs
2. Dacron synthetic vascular prostheses, which are used in human medicine, can be used with good results in veterinary medicine, at least for swine species
3. Anastomoses between vascular prostheses and blood vessel wall should be performed very carefully not to hampered blood flow, using for this angioraphy specific threads and needles
4. Monitored physiological constants were to superior limit in the first few days after surgery, staying in physiological limits throughout the observation. No complications were recorded.

REFERENCES