Este trabalho e arquivo PDF relacionado está licenciado sob uma Licença Internacional Creative Commons Atribuição 4.0.

This work and the related PDF file are licensed under a Creative Commons Attribution 4.0 International License.


REFERÊNCIA
Surgical Preparation of a Permanent Carotid Transposition in Sheep

Large Animal Hospital, School of Veterinary Medicine, University of Brasilia, Brasilia, Brazil
E-mail: robertagodoy@unb.br
Received August 3, 2011; revised September 1, 2011; accepted September 10, 2011

Abstract

In large animal research, when frequent sampling of arterial blood is needed, the carotid artery transposition is the most used technique. The objective of this paper is to describe a new technique for carotid artery transposition in sheep and evaluate its effectiveness using the echo-Doppler ultrasound. The animals enrolled in this study had their carotid surgically elevated to the subcutaneous level, by suturing underneath muscles sternocephalic and brachiocephalic. None of the animals that underwent the procedure in this study had trans- or postoperative complications. Six months after the suture removal, all animals presented patent carotids by echo-Doppler ultrasound. This is an easy and safe procedure for carrying out experiments that require the collection of arterial blood.

Keywords: Blood Gas Analysis, Echo-Doppler, Experimental Surgery

1. Introduction

Easy and rapid access to large-caliber arteries are frequently needed in invasive studies about hemodynamics and/or blood gas analysis in large animals, especially if multiple samples are required. These arteries should be accessible, but protected from trauma, and their patency should be maintained for long periods [1]. Several descriptions of displacement of the carotid artery to the subcutaneous tissue of ruminants have been reported in the literature [2-8]. Although this is a well studied technique, a new choice for this procedure allowing a patent carotid artery for a prolonged time is presented, as well as minimum complication is observed.

In the technique described in [4], an incision is made parallel and ventral to the jugular vein, in the transition between the middle and distal third of the jugular groove. The carotid artery is located and a 10 cm section is externalized. The dorsal and the ventral margin of the sternocephalic and brachiocephalic muscles are sutured underneath the artery and above the jugular. The skin is sutured over the carotid artery. The disadvantage of this technique is that the carotid is not immobilized in the subcutaneous tissue, hindering the collection of arterial blood [1].
paper is to describe a new technique for transposition of
the carotid artery in sheep and evaluate its effectiveness
using the apparatus of ultrasound with echo-Doppler.

2. Material and Methods

This study was approved by the Ethics Committee on
Animal Use (CEUA), at the University of Brasília (Bras-
ilia), under protocol 76850/2007.

2.1. Experimental Group

We used seven adult Santa Inês sheep with body mass
between 36 and 42 kg. Healthy status was determined by
physical exam, complete blood count, biochemistry
panel, and fecal flotation exam. Animals were kept in
confinement and were fed twice a day with Tifton grass,
water and salt ad libitum during the experiment. They
were monitored daily pre and postoperatively by physical
examination.

2.2. Anaesthetic Procedure and Monitoring

The animals were food fasted for 18 hours and water
fasted 8 hours before the procedure. The premedication
consisted of acepromazine (1% Acepran, Univet S/A, São
Paulo, Brazil) at the dose of 0.1 mg/Kg, IV. Anaesthesia
was induced with propofol (Propovan, Crystal, Itapira,
Brazil) at the dose of 4.4 mg/Kg IV. The intubation time
provided by this protocol was 5 minutes. The animal was
intubated with the aid of a laryngoscope, endotracheal
tube 7.5 with an extension and a guide wire.

Anesthesia was maintained with isoflurane (Isoforine,
Crystal, Itapira, Brazil) in 100% oxygen through a uni-
versal vaporizer and all animals were subjected to inter-
mittent positive pressure ventilation (Conquest Slim Fan,
HB Hospitalar, São Paulo, Brazil) with flow of 15
mL·kg·min⁻¹ O₂. The airway pressure was kept within 20
cm H₂O, with a tidal volume of 15 mL/kg and I:E ratio
was 1:3.

Monitors with heart rate (CardioPET, R & D Mediq
Ltda., São Paulo, Brazil) and SpO₂ measurements (Active
“ES”, Transform Advanced Technology Ltda., São Paulo,
Brazil) were used to monitor the anesthesia. Respiratory
rate and body temperature were also registered. Medium
arterial pressure (MAP) was measured with vascular
Doppler (Vet-Dop, VMED, Mill Creek, USA) positioned
over the right metatarsal artery.

2.3. Surgical Procedure

The animals were positioned in left lateral recumbency.
The animal’s head was positioned partly outside the sur-
gical bed providing a proper slope for drainage of the
saliva produced, preventing its accumulation.

Due to the proximity of left common carotid artery to
the esophagus, the right carotid artery was chosen for
this procedure which is easier to be exposed. An area of
about 15 × 20 cm in the region of the jugular groove, in
the right middle third of the neck, was shaved and pre-
pared for surgery with Polivylinypyrrolidone topic (Río-
deine, Rioquímica Pharmaceutical Industry, São Jose do
Rio Preto, Brazil) and iodine alcohol.

An incision of approximately 15 cm in a half-moon
shape was made in the skin (Figure 1) involving the
jugular groove. The skin and subcutaneous tissue was
retracted for the identification of the jugular vein (Figure
2). The jugular was displaced dorsally to allow the ob-
servation of the carotid artery. In a segment of approxi-
ately 10 cm of the carotid artery, small branches from
the artery were sutured with Vicryl 2 - 0 (Vicryl Ethicon,
Johnson & Johnson, São José dos Campos, Brazil) to
prevent bleeding.

The vagosimpathetic branch passing close to the ca-
rotid artery was identified and carefully dissected dor-
sally to avoid injury. The dorsal margins of the esterno-
cephalic muscle fascia and brachiocephalic ventral mar-
gin were sutured underneath the carotid and over the
jugular vein with 2 - 0 Vicryl in a simple continuous
pattern, keeping the segment of the artery near the skin
and covering the jugular vein (Figure 3). Finally, the
reduction of subcutaneous space was performed with
Vicryl 2 - 0 and the epidermal suture with 0 nylon in a
simple continuous pattern concluded the procedure.

2.4. Post-Operative Care

After surgery, the animals received cryotherapy for 15
minutes at the site of transposition, 10 mg/animal of

Figure 1. Incision in a half-moon shape in the skin sur-
rounding the jugular groove (dashed line).
dexamethasone (Dexacort, Marcolab, Sao Sebastiao do Paraíso, Brazil), IV, single dose, to avoid severe edema of the manipulated area, and 5 mg/kg of enrofloxacin (Zelotril 10%, National Union Pharmaceutical Chemistry, Embu Guaçu, Brazil), IM, every 24 hours for seven days. Dressings were applied daily with topical 0.1% polyvinylpyrrolidone (Rioquímica Pharmaceutical Industry, São José do Rio Preto, Brazil), and the suture was removed approximately ten days after the surgery.

Animals were examined by eco-Doppler ultrasonography (SonoHeart ELITE, SonoSite, USA) with a transducer frequency bandwidth of 4 - 7 MHz after suture removal and after six months of the surgical procedure to assess the patency of carotid blood flow and to measure the distance between the luminal and epidermis.

3. Results and Discussion

The technique used on this study was described in horses [10] and was easily performed without major complications.

Other authors [1,2,7,9] described post-surgical complications of arterial transposition, such as skin necrosis, abscess formation, peri-arterial hematoma, and accidental puncture of the carotid artery. None of the animals in this experiment had postoperative complications, possibly by postoperative procedures performed which included the use of dexamethasone, antibiotic therapy, and cryotherapy.

In all animals, blood flow in the carotid artery was present, securing its patency. The distance between the carotid artery and skin was measured and was less than 0.5 cm in all animals (Figure 4).

According to [1] the effectiveness of a transposition technique is verified by the patency of the carotid artery for a long time, allowing the animals to be used experimentally. In our experiment the carotid artery was evaluated for a period of six months, with maintenance of patency in all animals (100%), while [9] had 94% success with other technique.

So far, three years after the transposition, each animal had the carotid catheterized approximately twenty times for sequential collections during experiments involving anesthesia and acid-base imbalances. In all these times the artery was easily identified by its pulsation and no difficulty found in placing the 16 G catheter. With an aneroid sphygmomanometer (Premium Instruments Co. Ltd., Wenzhou, China) arterial pressure could be measured and the blood flow obtained in all catheterizations was similar to the first one, indicating that the artery’s lumen was maintained.

The technique described in this work for permanent carotid transposition in sheep proved to be easy to perform, allowing the adequate repositioning of the carotid...
artery for experiments that require multiple and frequent arterial blood collection.

4. Acknowledgements

The authors thank the Dean for Research and Graduate College of the University of Brasilia, CNPq for fellowships and undergraduate research and FINATEC for financial support.

5. References


