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Spinal anesthesia in a green turtle (*Cheloniamydas*) for surgical removal of cutaneous fibropapillomatosis.

Luciano Cacciari Baruffaldi Almeida da Silva[1], Fábio Parra Sellera[2], CristianeLassálvia Nascimento[3], Gustavo Henrique Pereira Dutra[3], Fabio Futema[4], Silvia RenataGaido Cortopassi[1]

[1]*Department of Surgery, School of Veterinary Medicine and Animal Science, University of São Paulo, Av. Prof. Dr. Orlando Marques de Paiva, 87 - CidadeUniversitária - 05508 - 270, São Paulo/SP – Brazil.*
[2]*Department of Internal Medicine, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo/SP – Brazil.*
[3]*Veterinary Unit of Santos Aquarium, Santos Aquarium, Brazil*
[4]*Department of Surgery, School of Veterinary Medicine, University of Guarulhos, Brazil*

Abstract:*Thispaper describes the use of spinal anesthesia to promote analgesiaduring a surgery procedure in a marine turtle. A green turtle (Cheloniamydas) presenting multiple cutaneous fibropapillomas was referred to surgery. After premedication the animal was positioned for epidural anesthesia, however after extravasation of cerebrospinal fluid was performed spinal anesthesia with isobaric bupivacaine 0.5%. Consequent to blocking response was not observed against the painful stimuli under spinal block, showing the success of the technique. Spinal anesthesia was efficient to promote analgesia during the surgery. More studies are fundamental to help anesthesiologists who deal with rehabilitation and conservation of this species.*

Keywords:*anesthesia, bupivacaine, chelonid, marine turtles, regional anesthesia*

I. Introduction

Sea turtles are reptiles that inhabit tropical and subtropical areas of the oceans, andplay a fundamental role in the marine ecosystem balance, mainly in the preservation of coral reefs and sandy beaches [1]. Five of the sevenknown speciesof sea turtles are described in Brazilian coastal areas: *Carettacaretta* (loggerhead turtle or yellow turtle); *Cheloniamydas*(green turtle); *Eretmochelysimbricata*(hawksbill turtle); *Lepidochelysolivacea* (olive ridley sea turtle) and *Dermochelyscoriacea* (leatherback turtle or giant turtle). Among them, *C. mydas* is reported as the most prevalent species on the Brazilian coast [2].

As slow growing species with long life cycle, the sea turtlesare extremely susceptible to human action. Several countries have developed programs aimed at the preservation of these animals; however, despite all efforts, such measures still have not been enough to ensure the survival of their future generations [3].

According to International Union for Conservation of Nature, all the speciesmentionedare vulnerable, endangered or critically endangered [4]. The increasingly constant anthropic interference in the oceans, either by the exploitation of their natural resources or by the disorderly occupation ofcoastal areas, is considered one of the most significant factors for the survival of these species. Moreover, there arereports of diseases that have also contributedto the declineof these populations around the world [5].

The fibropapillomatosis is an infectious disease that affects sea turtles, chiefly the green turtle (*C. mydas*). The etiology of this disease has not been fully clarified yet, but, in general, its prevalence is associated withpolluted coastal areas - contaminated with agricultural, domestic, and industrial wastes or marine biotoxins -high human density, and alsoectoparasites [6-8]. Besides, some tumor promoting viral agents are believed to be involved in the pathogenesis of the fibropapillomatosis [5]. The predominant lesions associated with this disease are fibroids, cutaneouspapillomas and fibropapillomas [9], and the most commonly used procedure is the surgical excision of the tumors,as no treatment has been considered effectiveso far [10-12].

Analgesia and pre-anesthetic medication are rarely practiced in reptiles, once there is scarce information about anesthesia in these species, mainly due to the physiological changes they present [13,14]. Local anesthesia techniques are not viable in wild animals if used alone; nevertheless they can be used associated with chemical restraint, sedation or even inhalational general anesthesia [15].

Spinal anesthesia, also called subarachnoid anesthesia, is a technique of regional anesthesia performednear the spinal cord [16,17]. Considered of fundamental importance in the practice of anesthesiology due to its high rate of success and predictability, this regional anesthetic modality is associated with many benefits, such as reduced morbidity and mortality, and better postoperative analgesia, when compared to general anesthesia alone [18,19].

The present study aimed to report the use and efficacy of spinal anesthesia for surgical excision of cutaneousfibropapillomatosis in a green sea turtle (*C. mydas*).

II. Case Study

A green turtle (*C. mydas*), weighing 35 kg, was referred with a history of cutaneous fibropapillomatosis formations, measuring 4to 5 cm in diameter, each, in the region of the rear flippers. The recommended treatment was the surgical removal of the neoformations. To this end, the anesthetic protocol chosen for the procedure had meperidine associated with midazolam as premedication, both at a dose of 1 mg/kg, applied intramuscularly in the left forelimb. After the latency of pre-anesthetic medication, the animal wasplaced in prone position, and the anesthetic induction and maintenance were performedwithpropofolat doses of 2 mg/kg and 0.3 mg/kg/min, respectively,intravenously, and under syringe infusion pump.The puncture was performed with a 25x0.70 mm needle aiming to accomplish the spinal block. Right after the puncture, some extravasation of cerebrospinal fluid was noticed in the needle, so 0.5% isobaric bupivacaine, at the dose of 0.1ml for each 10 cm of carapace, was promptly administered. (Fig. 1)

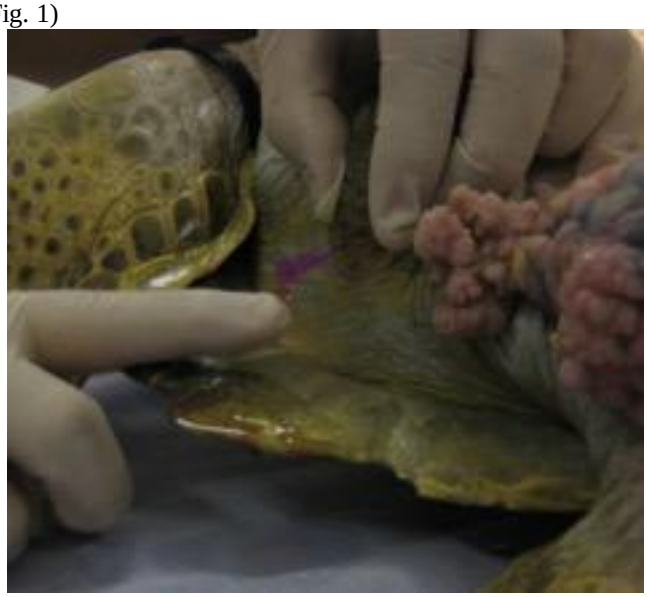

Figure 1.Presence of fibropapillomas on posterior flippers and extravasation of cerebrospinal fluid, confirming the subarachnoid space.

Immediately after the completion of regional block, and throughout the surgical procedure, responses to painful stimuli were no longer observed, which could be perceived by the absence of reactions,such asmovements of the front flippers or head;by theheart rate,measured through the arterial pulse with a vascular Doppler;by the respiratory rate; and also by protective reflexes.

III. Discussion

Several green turtle populations (*C. mydas*) have decreased in number since ancient times. On a world scale, the decline has ranged between 34 and 58% over the three most recent generations of the species (141 years), but, as the rate of decline has increasedover recent decades, these values may achieve higher levels [20].Thus, it becomes essential to better understandthe different diseases that affect the species, as well as any interventions they require.

Despite being described since the 1930s, the fibropapillomatosis still represents a major challenge for professionals who deal with sea turtles. The multiple external cutaneous tumors, of varying sizes, formedespecially at the base of the flippers, tail, neck and head, eyes included, require surgical intervention to ensure the good health of these animals and even enablethemto return to their natural habitat [7,8,21].

It is known that the incidence of the fibropapillomatosis in nature may endanger the affected animals by changing their hydrodynamics, compromising the capture of food, and making them more susceptible to predation [22,23]. In addition, these formations can also impact internal organs such as liver, lungs, and kidneys; and, in advanced disease stages, make the animals become weak, anemic, and, occasionally, even blind [7,8,22].

Given the high prevalence of the disease and the survival rate of over 90 percent after surgery, the surgical procedure can be considered a necessary and safe intervention [5], so the focus can be directed to other issues such as anesthetics protocols.

Anesthesia in chelonians is known as a major challenge due to the prolonged induction and recovery times, often associated with both inhalational and injectable protocols, and also to the complexity ofthe

anesthetic monitoring [24]. Regional anesthesia, in its turn, has been more widely used during surgical procedures in order to avoid the need for general anesthesia and the risks associated with it [25].

In spinal anesthesia, the local anesthetic, alone or in combination with other drugs [26], is injected in the subarachnoid space in order to block the neural conduction of nerve roots. Thus, it provides anintensesensory and motor blockade, which can be effectively reached with a small amount of local anesthetic [27] making this technique widespreadas a safe and effective method of promoting anesthesia in various surgical interventions [28,29].However, the extent and duration of such procedures become often unpredictable, as many factors regulate the kinetics of local anesthetics in the cerebrospinal fluid [30].

A crucial fact to be exposed from the report above is that, even unintentionally, the evidence of spinal fluid extravasation and the speed of the anesthetic block enabled a precise identification of the subarachnoid space. This punctual fact is of great relevance, once the techniques used for neuraxial blockades, in this type of patient, are called spinal blocks, exactly because of the difficulty in distinguishing precisely the subarachnoid space from the epidural space, even when techniques like computed tomography are employed [31].

Thus, the spinal anesthesia proved to be an effective and safe alternative for surgical excision of cutaneousfibropapillomatosis, providing satisfactory analgesia and anesthesia throughout the surgical procedure, as well as excellent anesthetic recovery. Several studies have been reported aiming to establish increasingly safer anesthetic procedures for sea turtles [32]. Thepresent report encourages further studies so that the physiological characteristics of these animals maybe better understood, ensuring, thereby, greater safety in surgical interventions.

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