

Sphinx Modified Position For Scaphocephalic And Complex Craniofacial Patients. Technical Note

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Abstract

Background

The development of less invasive surgical techniques means that surgical remodelling techniques can be performed at younger ages in more complex situations and at lower cost.

Methods

Descriptive study

Results

We describe the technique of positioning and reviews our experience with the partially-modified sphinx position (MSP) in a serie of 234 patients, 96 of these endoscopic procedures (EP). Patient position on the operating table with regard to the treatment area, as well as the position of the treatment area in regard to the floor plane, is paramount for their anaesthetic and surgical management.

Conclusions

We consider that MSP is safe, facilitates access to the operative field, shortens surgery time, reduces bleeding and offers maximum airway and cranio cervical safety in patients undergoing surgery to correct cranial vault pathologies.

Background

The development of less invasive surgical techniques means that cranial remodelling (CR) techniques can be performed at younger ages ,complex situations, and at lower cost, posing a challenge for anaesthetists and surgeons.

Ideally, the patient's position should be stable enough to permit surgical manoeuvring and to reduce complications to the minimum, ensuring vascular and respiratory access and preventing accidental extubation.

The prone decubitus (PD) with cervical extension, also known as the sphinx position, is possibly the most complex and the one that has received the least attention, thus we review our experience with a MSP in a long series of patients.

Surgical Positioning And Procedures

Retrospective study of patients undergoing CR for scaphocephaly and other craneostenoses, operated in MSP. All patients placed in position always by expert paediatric neurosurgeon and anaesthesiologist.

The positioning process is described in Fig. 1. Briefly this position is achieved by first placing the patient in prone decubitus, supporting the head on the malar region and leaving the ocular globes and orbits completely unobstructed. Two soft cotton and gauze rings, custom made for each patient, are used for support. Inclination may be varied depending on the area to be approached or type of procedure (video 1).

For EP, expanded suturectomy was the main surgical gesture, while for open approaches, modifications of π procedure were preferred. In general complete suturectomy was avoided in open procedures in order to preserve sagittal sinus area as possible, and sections of central bone around suture was preferred. Resorbable plates were used to stabilize the bones keeping the galea separated from the dura for favoring cranial growth. Special care is taken to avoid manoeuvres which could exert pressure on the spine-cranium system or eyes supporting the head manually (Fig. 2).

Thomography images were taken in some cases during the operation and compared with pre-surgery images. All complications were analysed until patients were definitively discharged (between 2–4 years after surgery).

Results

462 CR procedures performed over 16 years. 234 of which in MSP. 96 were EP. Patient ages from 7d to 24 months (mean 7 m).

No severe complications were observed during surgery and only one patient suffered a small lesion to the sagittal sinus, repaired without difficulty. In 6 cases intra (MSP) and preoperative (SD) CT scans were compared; none showed hyperextension of the neck (Fig. 3) or compression of endotracheal tubes. (Fig. 4)

Initial position was not corrected in any patient and in only 18%, it was necessary to tilt the operating table to optimise access. In only one case, venous air embolism (VAE) were suspected, but it was not necessary to interrupt CR. No complications that could be attributed to the patient's position were observed until definitive dismissal(2-4y).

Discussion

Early CR has been made possible thanks to the development of new surgical techniques and anaesthetic management but even considering that, patient's position on the operating table with regard to the treatment area, as well as in regard to the floor plane, and stabilization, is paramount for correct anaesthetic and surgical management preventing associated complications.

The use of head frames and classical stabilisation is not always possible in younger children a MSP, may involve complications and it is also completely impossible in newborns.

The two positions procedures, with SD for access to the anterior cranial vault and prone position (PP) for access to the posterior portion prevent cervical hypertension and jugular venous return is not compromised. However, simple PP fails to prevent increased intraocular pressure and lesions to the optical nerve and a second surgical procedure or re-positioning during surgery is required.

We have had very good results with a MSP. It that can be used in newborns and older children and does not require cranial stabilisation. Obviously, highly expert surgeons need to be involved to ensure that the head is always supported when there is a greater risk of pressure. (Fig. 2). In any case, and particularly in smaller children, it is normal practice for experienced paediatric neurosurgeons.

It consists of a PP with cervical extension – though not hyperextension – being thus suitable for patients with cervical abnormalities. Greater calvarial exposure is achieved by using a reverse Trendelenburg position with an inclination of 30–45° instead of hyperextension. In our series, no variation in the patient's position on the table was required during surgery, and we experienced no problems related with insufficient cranial access.

The head is supported on the malar region, resting on a padded surface customised to adapt perfectly to the size of each patient better than market solutions', avoiding changes in position and periodical head lifting.

MSP offers a balance between controlling the risk of venous haemorrhaging and VAE⁴. Except in one case, we have found no reports of serious complications when the head was supported in this position.

In MSP there is no over-extension of the cervical region, as we verified by CT scans (Fig. 4). Interestingly, we observed no changes in patients in the SD/MSP, possibly because posterior deformations in scaphocephalic children are associated with changes in the head-neck relationship. As far as we know, no studies objectively evaluating the cranial-spinal relationship in this type of surgery have been performed.

The tube placed between the two rings and combined with the non-hyperextended position helps to prevent accidental extubation without airway compromise. (Fig. 5).

Conclusions

MSP facilitates access to the operative field, shortens surgery procedures, reduces bleeding from the dural sinuses and offers maximum airway safety in patients undergoing surgery to correct cranial vault pathologies. In our experience, it involves no substantial changes in the cranial-spinal relationship nor in the positioning of the airways and endotracheal tube.

Abbreviations

CR	Cranial remodelling
PD	Prone decubitus
SD	Supine decubitus
PP	Prone position
MSP	Modified sphinx position
EP	Endoscopic procedures
CT	Cranial tomography
VAE	Venous air embolism

Declarations

Ethics approval and consent to participate

All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the parents before every single surgical procedure.

This study was supported by the ethics committee of our institution. (CEI de los hospitales universitarios Virgen Macarena-Virgen del Rocío in Spanish or – Ethical and investigational comitte of University Hospitals Virgen Macarena – Virgen del Rocío). The database review does not require specific committee approvals.

Consent for publication

The videos and photos have been made with the aim of making the recognition of patients impossible. In any case, the parents or legal guardians have authorized the use of the images included in the article.

Availability of data and materials

The datasets and pictures used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

"The authors declare that they have no competing interests"

Funding

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Authors' contributions

MB has elaborated the protocol and and was a major contributor in writing the manuscript.

TV has advised about anesthetics aspect.

RG has contributed to write the paper.

GG has reviewed stadistical aspects.

MR has advised about the neurosurgical aspect.

All authors read and approved the final manuscript

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Figures

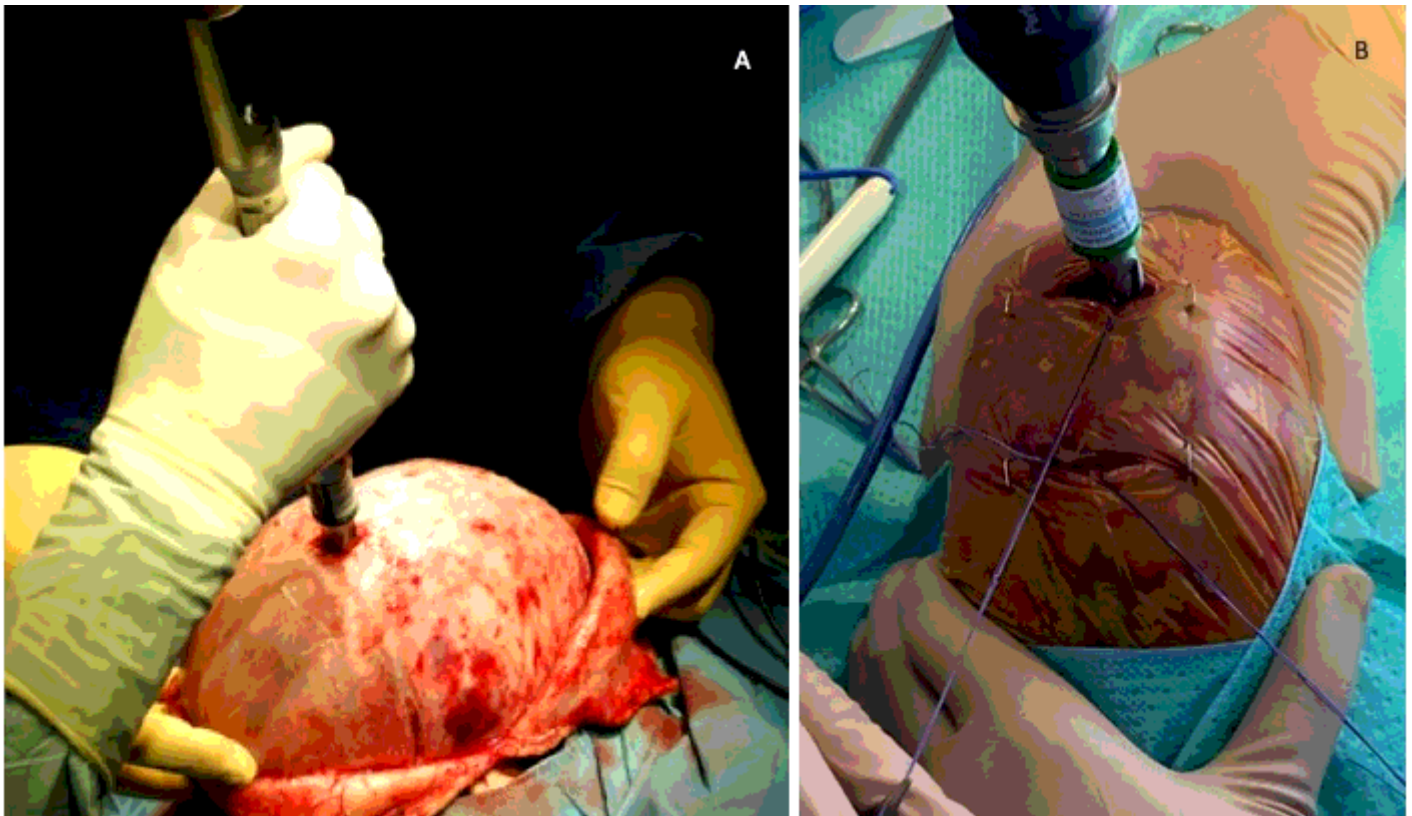


Figure 1

"Modified sphinx" position. This position is achieved by first placing the patient in prone decubitus, supporting the head on the malar region and leaving the ocular globes and orbits completely unobstructed. Two soft cotton and gauze rings, custom made for each patient, are used for support. The endotracheal tube is guided between the two rings and easily connected to the ventilator and the tubing connecting the endotracheal tube to the respirator rests on the operating table. Cervical hyperextension is avoided by placing the body in the reverse Trendelenburg position with a 30-45° tilt. The degree of inclination may be varied depending on the area to be approached, ensuring no variation in cervical extension. The arms are placed forward to favour venous return.

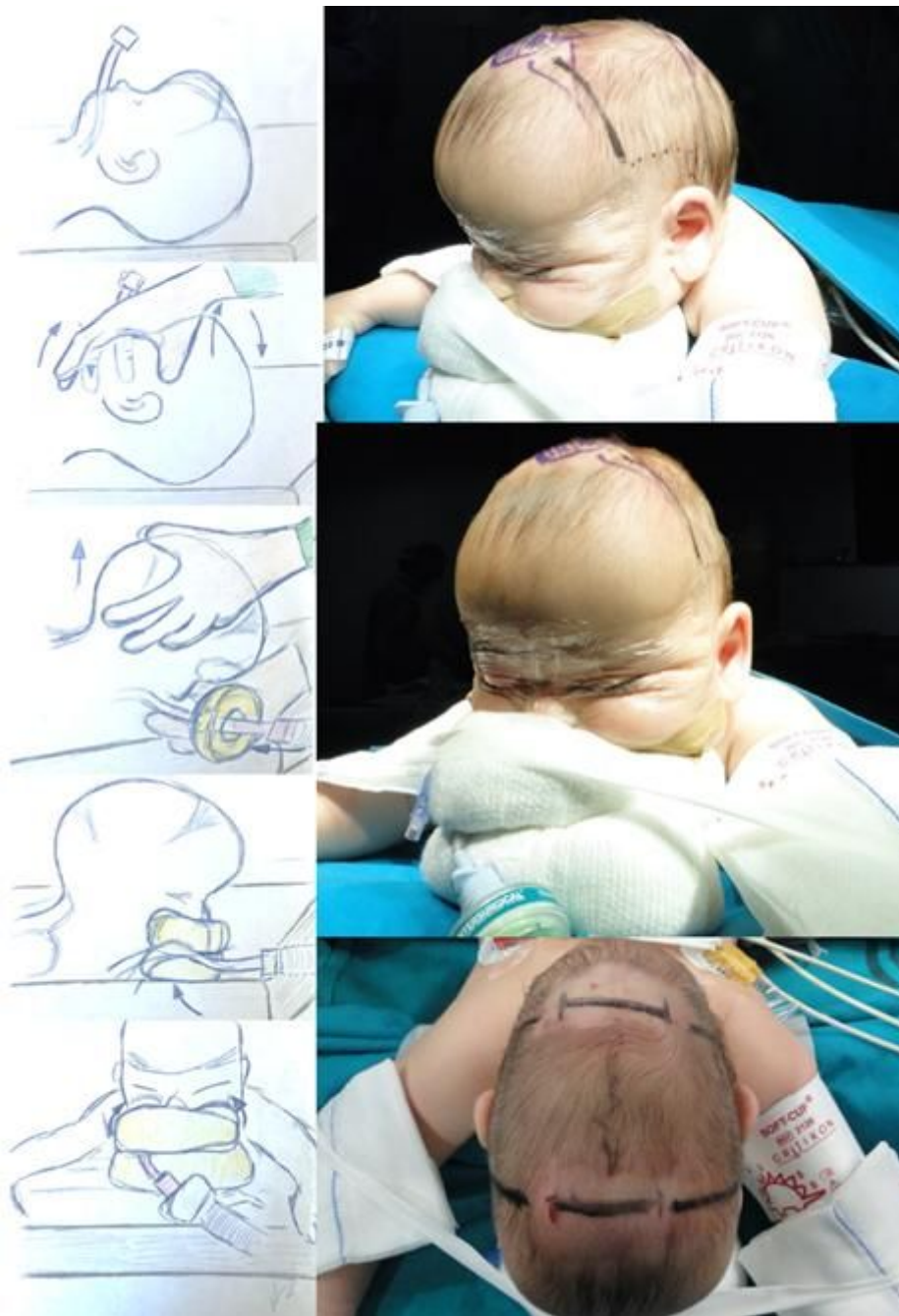


Figure 2

The head is supported manually by the surgeon in the course of the operation. A: open procedure. B Endoscopic CR.



Figure 3

Intraoperative CT scan compared in supine decubitus and MSP

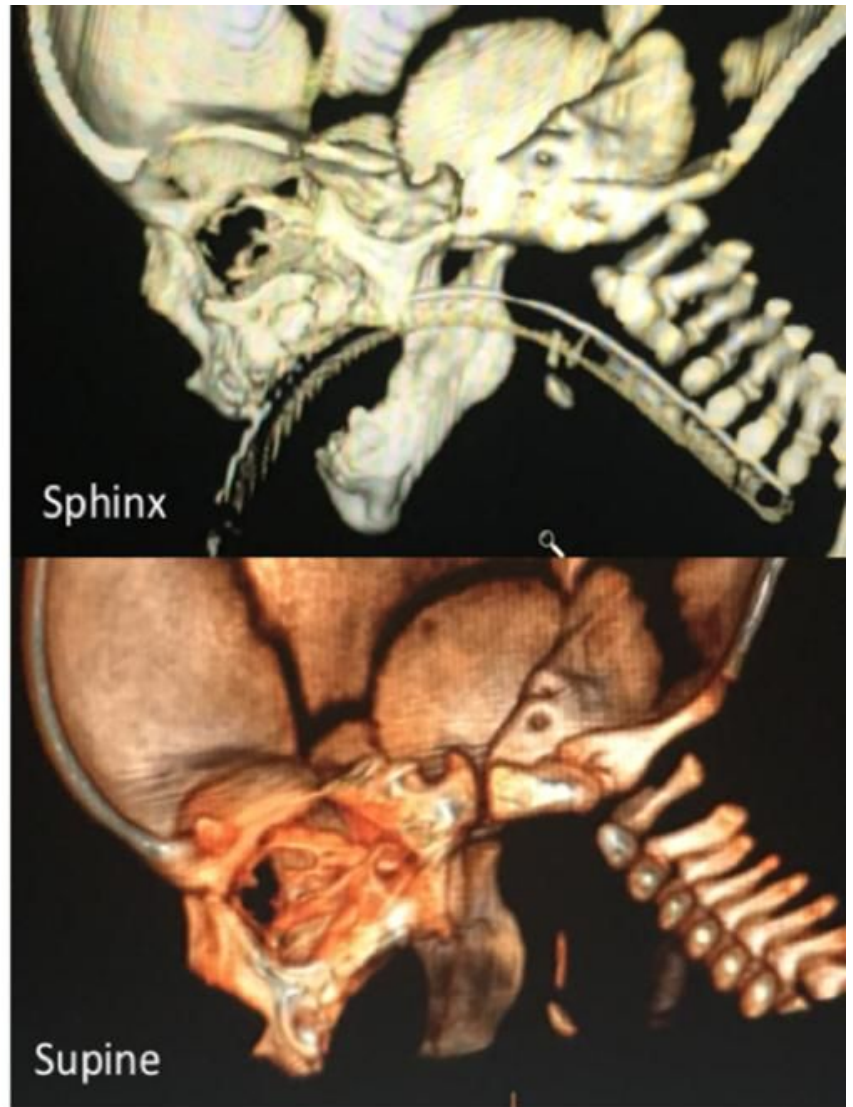


Figure 4

Surgical images in anterior view with a similar projection in intraoperative CT evaluating the position of the rings and the endotracheal tube. There is no pressure on the orbits and the airways are not compromised.

Supplementary Files

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- [SphinxpositionpositioningBCalidad.mp4](#)