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Haemodynamic monitoring for foetal surgery: open versus foetoscopic repair of myelomeningocele

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To the Editor,

Myelomeningocele (MMC), a severe form of spina bifida, is characterised by protrusion of the meninges and spinal cord through a defect in the vertebral column [1]. MMC occurs in approximately 1 in 3,000 live births in the United States [2]. Procedure-associated maternal and foetal risks were determined for both open and foetoscopic repair of MMC. However to date, there has been no comparison of intraoperative haemodynamic management. *We* have *recently published the results of* a conformational analysis of perioperative data during foetoscopic surgery [3]. In this case series, we aimed to evaluate the stability of haemodynamic parameters and blood gas values during open foetal surgery.

Following securing the patients' written informed consent, we analysed the data of 4 patients undergoing open foetal surgery for myelomeningocele at 26 weeks' gestation. The mean age was 33.3 ± 4.3 years. A $PICCO_2$ monitor was used for haemodynamic monitoring. We analysed the data before surgery, during surgery at 1st hour and immediately after the surgical procedure.

Foetal cardiac activity was monitored during foetal surgery in order to assess foetal viability and well-being, while intermittent foetal umbilical blood flow was measured. Afterwards, peak systolic (PS) and end-diastolic (ED) umbilical blood flow patterns were recorded during anaesthesia induction (T_1), foetal meningocele repair (T_2) and after the uterus had been closed (T_3). Preoperative and postoperative haemodynamic data of the patients showed no significant difference (Table 1). During anaesthesia and surgery, umbi-

Table 1. The hemodynamic variables during the perioperative period

		min–max			median	mean±sd			*P**		*P***	
PPV	1st measurement	7,0	–	13,0	12,0	10,7	±	3,2				
	2nd measurement	10,0	–	13,0	11,0	11,3	±	1,5	0,109	w		
	3rd measurement	10,0	–	17,0	13,0	13,3	±	3,5	0,109	w	0,285	w
PVPI	1st measurement	1,4	–	2,0	2,0	1,8	±	0,3				
	2nd measurement	1,7	–	2,0	1,8	1,8	±	0,2	0,655	w		
	3rd measurement	1,4	–	2,0	1,7	1,7	±	0,3	0,785	w	0,655	w
EVLW	1st measurement	375,0	–	448,0	428,0	417,0	±	37,7				
	2nd measurement	411,0	–	428,0	428,0	422,3	±	9,8	0,108	w		
	3rd measurement	375,0	–	439,0	411,0	408,3	±	32,1	0,108	w	0,109	w
SV	1st measurement	65,0	–	81,0	65,0	70,3	±	9,2				
	2nd measurement	67,0	–	79,0	77,0	74,3	±	6,4	0,109	w		
	3rd measurement	78,0	–	81,0	79,0	79,3	±	1,5	0,109	w	0,655	w
SVR	1st measurement	710,0	–	920,0	810,0	813,3	±	105,0				
	2nd measurement	670,0	–	1000,0	710,0	793,3	±	180,1	0,655	w		
	3rd measurement	670,0	–	840,0	710,0	740,0	±	88,9	0,593	w	0,655	w
SVV	1st measurement	4,0	–	23,0	12,0	13,0	±	9,5				
	2nd measurement	6,0	–	11,0	9,0	8,7	±	2,5	1,000	w		
	3rd measurement	7,0	–	18,0	12,0	12,3	±	5,5	1,000	w	0,180	w
CO	1st measurement	5,9	–	7,3	6,8	6,7	±	0,7				
	2nd measurement	5,0	–	7,1	5,7	5,9	±	1,1	0,285	w		
	3rd measurement	6,4	–	7,3	6,7	6,8	±	0,5	1,000	w	0,285	w
CVP	1st measurement	5,0	–	15,0	10,0	10,0	±	5,0				
	2nd measurement	10,0	–	15,0	10,0	11,7	±	2,9	0,317	w		
	3rd measurement	10,0	–	15,0	15,0	13,3	±	2,9	0,157	w	0,317	w

PPV: pulse pressure variation; PVPI: pulmonary vascular permeability ındex; EVLW: extravascular lung water; SV: stroke volume; SVR: systemic vascular resistance; SVV: stroke volume variation; CO: ca[rd]iac output; CVP: central venous pressure

Table 2. The umblical flows obtained from patients:

1st patient:
(T_1): PS: 34.5 cm sec^{-1}, ED: 14.4 cm sec^{-1}
(T_2): PS: 28.6 cm sec^{-1}, ED 11.9 cm sec^{-1}
(T_3): PS 30.3 cm sec^{-1}, ED 12.2 cm sec^{-1}
2nd patient:
(T_1): PS: 28.1 cm sec^{-1}, ED: 9.2 cm sec^{-1}
(T_2): PS: 20.0 cm sec^{-1}, ED 5.3 cm sec^{-1}
(T_3): PS 21.7 cm sec^{-1}, ED 7.5 cm sec^{-1}
3rd patient:
(T_1): PS: 32.5 cm sec^{-1}, ED: 12.8 cm sec^{-1}
(T_2): PS: 25.3 cm sec^{-1}, ED 10.8 cm sec^{-1}
(T_3): PS 28.4 cm sec^{-1}, ED 11.7 cm sec^{-1}
4th patient:
(T_1): PS: 31.2 cm sec^{-1}, ED: 10.4 cm sec^{-1}
(T_2): PS: 22.4 cm sec^{-1}, ED 7.8 cm sec^{-1}
(T_3): PS 24.4 cm sec^{-1}, ED 8.5 cm sec^{-1}

lical blood flows, especially diastolic flow, may decelerate. These changes were reversible, and returned to normal after surgery (Table 2). There were no complications.

In both open and foetoscopic procedures, neither the umbilical blood flows nor the haemodynamic parameters changed significantly. Both methods have been demonstrated to improve paediatric outcomes. However there are several limitations when comparing the techniques. The small sample size is one major factor in order to estimate the long-term neurodevelopmental outcomes. Joyeux *et al.* [4] compared the results of published papers on the foetoscopic (n = 51) and open approachs (n = 71). The perinatal mortality and shunt rate at 12 months were similar. In our series, hydrocephalus and chiari type II malformation improved later in all cases while none of the patients needed ventriculoperitoneal shunt after birth. On the other hand, foetoscopic surgery required a longer operation time (223 vs. 105 min, $P < 0.001$), had a higher rate of postnatal reoperation (28% vs. 2.56%, $P < 0.001$) and a preterm prelabor membrane rupture rate (84% vs. 46%, $P < 0.001$) with an earlier gestational age at birth (32.9 vs. 34.1 weeks, $P = 0.03$). In our comparison, the mean duration time for the foetoscopic and open approachs were 255 minutes and 130 minutes, respectively ($P < 0.05$). Besides the Pulse Pressure Variation Pulmonary Vascular Permeability Index, extravascular lung water or the stroke volume were valuable parameters for us to evaluate foetal well being. We supported our results with umbilical cord flow rates. Therefore, by $PICCO_2$ monitoring and Doppler ultrasound, goal-directed anaesthetic and surgical management provided optimal maintenance of foetal and maternal well-being.

In conclusion, although there are technical differences between minimally invasive and open procedures, both methods have similar effects in haemodynamic monitoring parameters and umblical cord flow.

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References:

1. Kabagambe SK, Jensen GW, Chen YJ, et al. Fetal surgery for myelomeningocele: a systematic review and meta-analysis of outcomes in fetoscopic versus open repair. Fetal Diagn Ther. 2018; 43(3): 161–174, doi: 10.1159/000479505, indexed in Pubmed: 28910784.
2. Committee on Obstetric Practice, Society for Maternal-Fetal Medicine. Committee Opinion No. 720 Summary: Maternal-fetal surgery for myelomeningocele. Obstet Gynecol. 2017; 130(3): 672–673, doi: 10.1097/AOG.0000000000002294, indexed in Pubmed: 28832482.
3. Saracoglu A, Saracoglu KT, Kafali IH. The importance of maintaining an optimal hemodynamic state during minimally invasive fetal surgery. J Clin Anesth. 2016; 34: 365–366, doi: 10.1016/j.jclinane.2016.05.017, indexed in Pubmed: 27687411.
4. Joyeux L, Engels AC, Russo FM, et al. Fetoscopic versus open repair for spina bifida aperta: a systematic review of outcomes. Fetal Diagn Ther. 2016; 39(3): 161–171, doi: 10.1159/000443498, indexed in Pubmed: 26901156.

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