

Placenta accreta spectrum anaesthetic management with neuraxial technique can be facilitated by multidisciplinary groups

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ABSTRACT

Background: The concern about massive haemorrhage associated with placenta accreta spectrum (PAS) prompts the routine use of general anaesthesia (GA) at many centres. We aimed to describe the effects of establishing a fixed multidisciplinary team (PAS team) on anaesthetic practices and clinical results. **Methods:** In this before-and-after study, we included patients with prenatal PAS suspicion treated between December 2011 and December 2019. We evaluated the anaesthetic techniques used before (Group 1) and after (Group 2) a PAS team was established. **Results:** Eighty-one patients were included. Neuraxial anaesthesia (NA) was used in 23.3% of group 1 patients and 76.4% of group 2 patients. Likewise, the frequency of conversion to GA after initial management with NA decreased from 14.3% in group 1 to 7.7% in group 2. **Conclusions:** The establishment of a PAS team is related to increased use of NA during the management of PAS patients.

Key words: Anaesthesia obstetrical, interdisciplinary communication, placenta accreta spectrum

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INTRODUCTION

Placenta accreta spectrum (PAS) is one of the main causes of massive obstetric haemorrhage. Although neuraxial anaesthesia (NA) has advantages over other surgical techniques among pregnant woman in terms of the risk of maternal pulmonary aspiration and neonatal results,^[1] general anaesthesia (GA) is routinely used as the standard anaesthetic method in some centres for PAS patients.^[2,3] This is especially true in developing countries where the availability of PAS fixed multidisciplinary teams (PAS team) are often lacking.^[4]

The organisation of available human, and technological resources, as well as the level of experience provided by PAS teams, has been shown to affect clinical outcomes.^[5] The current study aimed to determine the impact of establishing a PAS team for the protocolised management of women with PAS on the anaesthetic practices of an obstetric referral centre.

METHODS

This retrospective study has the approval of the IRB/EC institutional biomedical research ethics committee (in March 2020 under the protocol number 929) and was conducted between December 2011 and December 2019. We included patients with prenatal PAS suspicion (ultrasound or magnetic resonance imaging) who underwent a caesarean section at Fundación Valle de Lili, Cali, Colombia. Patients without prenatal PAS suspicion (incidental finding during surgery) were excluded. The included

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population was divided into those treated by the on-call specialists on the day of surgery (Group 1: from December 2011 to April 2016) and those treated by the PAS team (Group 2: from May 2016 to December 2019).

The surgical protocols used at our institution before and after April 2016 have been described previously^[6] and can be consulted in the addendum [Supplementary Material 1].

In both groups, the anaesthetic technique was selected at the discretion of the treating anaesthesiologist. However, since April 2016 formal communication (before, during and after surgery) was established between anaesthesiologists and surgeons to promote the use of NA [Supplementary Material 2].

All statistical analyses were conducted using the STATA® statistical software package. The quantitative variables were presented as median and interquartile ranges or means and standard deviations (according to the distribution of the values), and the qualitative variables were presented as frequencies and proportions.

Between-group comparisons of the qualitative variables were conducted using a Chi-square or Fisher's exact test. For the quantitative variables, the Mann-Whitney U test was used.

RESULTS

A total of 81 patients with prenatal suspicion of PAS were included in the analysis. The median interquartile range (IQR) age was 33 (28–34) years, with a median (IQR) gestational age of 35 weeks (34–36).

NA was used in 23.3% of the patients in group 1 patients and 76.4% of the patients in group 2 [Table 1]. One patient in group 1 (14.3%) and three in group 2 (7.7%) required the conversion to GA after initial management with NA due to insufficient pain control during surgery.

Prenatal PAS suspicion was confirmed with intraoperative or histological findings in 80% of the group 1 of patients and 68.6% of the group 2 patients, and placenta praecreta was detected in 16.7% and 15.7% of the patients in groups 1 and 2, respectively. The lower uterine segment, cervix or parametrium

involvement (S2 involvement) was detected in 43.3% and 45.1% of the patients in group 1 and group 2, respectively.

The median (IQR) for intraoperative bleeding was 2000 mL (1500–2500) in group 1 and 1480 (800–1975) mL in group 2. The median (IQR) volume of packed red blood cells was 0.5 (0–3) and 0 (IQR 0–2) units in groups 1 and 2, respectively.

The operative time (anaesthesia plus surgical time) was shorter in group 2 than in group 1 (190 minutes vs. 275 minutes in group 1). Additionally, the hysterectomy rate was lower in group 2 (49% vs. 76.7% in group 1), and these patients had a shorter length of hospital stay (2 days vs. 4 days in group 1). Scheduled surgeries (c-sections) were performed in 66.7% and 76.7% of the patients in groups 1 and 2, respectively. Although these results are related to the characteristics of PAS involvement, they are important to analyse the frequency of NA use in each group.

Group 2 had a lower need for pelvic tamponade (9.8% vs. 33.3% in group 1), lower incidence of infectious complications (7.8% vs. 20% in group 1) and rate of complications related to surgery (17.6% vs. 36.7% in group 1). The frequency of bladder injury (16.6% in group 2 vs. 17.6% in group 1) was similar between the groups.

One complication related to anaesthesia was documented in group 1 (bronchoaspiration during orotracheal intubation in a scheduled surgery), and no such complications were documented in group 2.

DISCUSSION

In this before-and-after study, we found a higher frequency of use of NA as the initial strategy for PAS patients after the introduction of a PAS team (76.4% in Group 2 vs. 23.3% in Group 1).

The frequency of use of NA in Group 1 was much lower than that reported in industrialised countries, where up to 95% of patients were managed with NA,^[7] but higher than that reported in other developing countries, where up to 96.4% of cases were handled with GA.^[8]

It seems that the implementation of a PAS team facilitates the use of NA. This can be explained

Table 1: Clinical characteristics of patients with prenatal PAS suspicion according to the surgical protocol applied

Variable	Group 1 (n=30)	Group 2 (n=51)	P
NA as initial strategy, n (%)	7 (23,3)	39 (76,4)	0,0287
GA as initial strategy, n (%)	23 (76,6)	12 (23,5)	0,0002
GA after NA as initial strategy, n (%)	1 (14,3)	3 (7,7)	0,565
Confirmation of suspected prenatal PAS	24 (80)	35 (68,6)	0,893
PAS suspected but discarded intraoperative	6 (20)	16 (31,4)	0,453
Accreta-Increta, n (%)	19 (63,3)	27 (52,9)	0,1
Percreta, n (%)	5 (16,7)	8 (15,7)	0,381
Involvement of the uterine vascularization sector 2 (S2 involvement)*	13 (43,3)	23 (45,1)	0,480
Gestational age at birth (weeks) [†]	35 (34-37)	35 (34-36)	0,243
Bleeding during surgery (ml) [†]	2000 (1500-2500)	1480 (800-1975)	0,0087
Units of red blood cells transfused [†]	0,5 (0-3)	0 (0-2)	0,2
Total operation (anaesthesia and surgery) time (min) [†]	275 (200-312)	190 (157-241)	0,0002
Postoperative in-patient stay (days) [†]	4 (3-8)	2 (2-4)	0,0002
Scheduled surgery, n (%) [‡]	23 (76,7)	34 (66,7)	0,401
Hysterectomy, n (%)	23 (76,7)	25 (49)	0,007
Bladder injury, n (%)	5 (16,6)	9 (17,6)	0,1
Need for pelvic tamponade, n (%)	10 (33,3)	5 (9,8)	0,083
Infectious complications [§]	6 (20)	4 (7,8)	0,007
Any intra- or postoperative complication related to surgery	11 (36,7)	9 (17,6)	0,033
Complication related to anaesthesia, n (%)	1 (3,3)	0	0,941

Group 1: Before PAS team. Group 2: After PAS team. NA: Neuraxial anaesthesia. GA: General anaesthesia. NA + GA: Neuraxial anaesthesia with unplanned conversion to general anaesthesia. PAS: Placenta accreta spectrum. *Lower uterine segment, cervix or parametrium, [†]median (interquartile range), [‡]surgery performed in the absence of active bleeding and 6 h after admitted, [§]surgical wound infection, pelvic abscesses, fever of undetermined cause, and sepsis, ^{||}visceral trauma, infections, thrombosis, re-bleeding and re-laparotomy.

because multidisciplinary work dynamics facilitated the development of trust among the group of surgeons and anaesthesiologists, allowing them to understand the local capacities for the prevention and immediate control of bleeding. Additionally, the PAS team acquired more experience as they treated more cases, simplifying the procedure and shortening the surgical time.^[5]

Although centres that have all the desired human and technological resources available are more common in developed countries, it is possible to organise these technological resources and interdisciplinary groups in some specialised centres in developing countries.^[6]

The conversion rate to GA in patients initially managed with NA has been reported to be as high as 44% in some case series.^[4] Although it is difficult to rule out factors associated with the operator when talking about NA failure, our study sought to evaluate the impact of forming a fixed interdisciplinary group (with all the variables like teamwork and greater expertise acquired) in the anaesthetic technique used. We observed a lower conversion rate to GA in patients managed by the PAS team (7.7% in group 2 vs. 14.3% in group 1), without associated complications as bronchoaspiration, and always motivated by insufficient control of operative pain.

The absence of NA-associated complications and its utility even in severe cases, with prolonged

surgical times, make us agree with other authors that considering NA as the first option in the management of patients with PAS is a safe strategy,^[9,10] even in developing countries, as long as the procedure is carried out by experienced groups in centres with the necessary resources. However, it should not be ignored that each centre must consider the specific condition of each patient when selecting the type of anaesthesia.^[11,12]

Limitations of our study include its design; we performed a retrospective before and after study, which makes our results at high risk of selection and information biases. Second, the small sample size imposes limitations on subgroup analyses and limits the external validity of our results. However, PAS is a rare condition with multiple management options, and it is difficult to include larger populations in studies.

CONCLUSION

The participation of PAS team improves the frequency of use of NA. NA is safe to use during the surgical treatment of PAS, even in severe cases, when it is used in reference centres.

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Conflicts of interest

There are no conflicts of interest.

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Supplementary Material 1: Anaesthetic and surgical protocols

Anaesthetic protocol

In all patients (groups 1 and 2), pre-anaesthesia laboratory evaluations were included, including blood count and fibrinogen. Clotting times were measured in patients with bleeding before surgery.

The anaesthetic risks of each of the possible techniques were explained and informed consent was obtained.

Before April 2016, there was no specific anaesthetic protocol to guide the management of patients with PAS; it was the treating anaesthesiologist who decided which anaesthetic technique to use and how to implement it. The anaesthetic protocol after April 2016 (group 2) included the use of a designed checklist for PAS management. It was recommended to administer an H2-receptor antagonist (ranitidine) and a prokinetic agent (metoclopramide) 1 h before surgery. Additionally, two units of compatible red blood cells were available in the operating room.

The combination of spinal and epidural anaesthesia was the preferred technique unless the patient's clinical situation required other techniques.

An epidural catheter was placed at the T8-T10 level, which facilitated the extension of the anaesthetic level if required. Furthermore, spinal anaesthesia was administered with 10 mg hyperbaric bupivacaine + intrathecal morphine at doses between 70 and 100 µg.

A central venous catheter was inserted under ultrasound guidance, depending on the haemodynamic status (only if it was required for pressor or large volumes of blood/fluid administration).

Surgical protocol

The surgical protocol used before April 2016 (group 1) began in the surgery room, with general anaesthesia (GA), central venous access with a high-flow device, two peripheral venous accesses and a radial arterial line followed by ureteral catheterisation. The patient was transferred to the fluoroscopy room for common iliac arteries balloons placement via bilateral femoral puncture. Then she returned to the operating room for midline laparotomy, c-section, foetal fundal extraction without attempting placental separation and hysterectomy.

After April 2016 (group 2), the new surgical protocol included a fixed multidisciplinary team (the same specialists in all cases) composed of some perinatologists, radiologists, urologists, intensivists, obstetricians, trauma surgeons, pathologists, anaesthesiologists and nursing professionals with a particular interest in PAS. Pre-surgical multidisciplinary meetings were carried out, the prenatal imaging findings (US, MRI) were discussed and the risk of bleeding and neighbouring organ compromise was discussed. The patients were divided according to their bleeding risk, as identified in the prenatal images. High risk of massive intraoperative bleeding: those with the involvement of the lower uterine segment, cervix or parametrium (uterine vascularisation sector 2, S2). Low risk of massive intraoperative bleeding: those with the involvement of the uterine body and upper uterine segment (uterine vascularisation sector 1, S1).

The entire surgical technique was conducted in the operating room, using two peripheral venous accesses (16 or 18 gauge), and a radial arterial line. Ureteral catheterisation followed by unilateral femoral puncture and placement of resuscitative endovascular balloon occlusion of the aorta (REBOA) if necessary (if high risk of massive intraoperative bleeding was defined: S2 involvement); midline/transverse laparotomy (based on the risk of haemorrhage); vesicouterine space dissection; and intraoperative decision to perform a hysterectomy or placental-myometrial en bloc resection (conservative surgical management). Postoperative debriefing meetings were also carried out.

In addition to changes in the surgical procedure, new PAS management included a strengthening of continuous anaesthesiologist - surgical group communication during prenatal assessments (periodic interdisciplinary meetings with clinical cases discussion, the publication of the surgical plan through institutional chat, including the strategies available for bleeding control in each particular case), surgical procedure (determination of the risk of haemorrhage at laparotomy and during the critical moments of the surgery) and the postoperative period (periodic debriefing meetings).

Supplementary Material 2: Activities on the new protocol aimed at promoting communications within the PAS team

Before the surgical procedure

The three anaesthesiologists of the PAS team were notified of all patients with prenatal suspicion of PAS at the time the suspicion was established, as were the other members of the group (MFM, radiologists, obstetricians, intensivists, surgeons, pathologists, transfusion medicine specialists)

Through an institutional chat, the findings of the prenatal images (US and/or MRI) were shared and the risk of massive bleeding was established: High risk if there was S2 involvement (involvement of the cervix, parametrium or lower part of the uterine segment).

Before the surgery, the management options of the possible bleeding were proposed, reviewing plans A, B and C that could include, among other options: uterine tourniquet, resection of the abnormal myometrium, hysterectomy, aortic occlusion with REBOA, manual compression of the aorta, pelvic tamponade, intraoperative blood recovery (cell saver) and massive transfusion.

Evaluation of haemoglobin levels, their optimisation if necessary and confirmation of the availability of compatible blood components.

Formal evaluation by the anaesthesiologist, recommending NA as a first choice and evaluating special situations in which the anaesthesiologist may prefer GA (contraindications for NA, very high risk of haemodynamic instability during surgery or presence of that situation before surgery, etc.)

PAS team anaesthesiologist's participation at periodic consensus meetings.

During the surgical procedure

Review of the surgical plan before starting the anaesthesia procedure (safety protocol)

If the anaesthesia procedure could not be performed by one of the three PAS team anaesthesiologists, the anaesthesiologist in charge should contact them to discuss the anaesthesia plan and follow the pre-established checklist

Prospective quantification of bleeding during the surgery, evaluating suction devices, using a calibrated perineal bag, and quantifying bloody pads.

Activation of intraoperative cell saver when ten soaked pads or more than 1500 ml of total bleeding are quantified

Continuous communication during surgery with the surgical group. Three moments were established where bleeding could occur and when the possibility of immediate bleeding control should be made clear: 1. Bleeding before surgery due to placenta previa (in this case, it may take some time to control bleeding, and GA is probably preferred). 2. Bleeding during vesicouterine dissection (possibly bleeding at this time would be easily controlled and although the timing of foetal extraction could be affected, it was unlikely that the mother would suffer haemodynamic instability). 3. Bleeding during hysterectomy or reconstructive-resective surgery (the surgical team should report the possibility of the immediate control of the bleeding and with that information evaluate the need to convert to GA)

Permanent availability of aortic occlusion using REBOA or manual compression of the aorta with large bleeding volumes or if the haemodynamic imbalance was present

Availability in the operating room of two units of compatible packaged red cells, in cold chain

After the surgical procedure

Discussion of operative findings, anaesthetic and surgical results in the institutional chat

Monthly debriefing meetings reviewing the cases handled each month

Review of quality performance measures in PAS

Critical analysis of clinical outcomes through formal observational scientific research

Adjustments to the PAS team management protocol when deemed necessary

PAS: Placenta accreta spectrum, MFM: maternal-foetal medicine specialist, US: obstetric ultrasound, MRI: Magnetic resonance imaging, NA: Neuraxial anaesthesia, GA: General anaesthesia, REBOA: resuscitative endovascular balloon occlusion of the aorta