

Third and Fourth Degree Perineal Tear in Four-Year Period at Sestre Milosrdnice University Hospital Center, Zagreb, Croatia

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Abstract

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OBJECTIVES: Obstetric anal sphincter injury (OASIS) includes the third and fourth degree of perineal injury. The risk for OASIS is about 1% of all vaginal deliveries. If not recognised and treated properly, obstetric anal sphincter injury can have serious consequences for reproductive age woman.

MATERIAL AND METHODS: We have retrospectively gathered and analysed data on obstetric anal sphincter injury in a four-year period at our department. The control group in this study included vaginal deliveries in 2012.

RESULTS: We recorded 0.34% third and fourth degree of perineal injury in all vaginal deliveries, and 87.9% of those patients were primiparae. Episiotomy was performed in 57.6% of all women with obstetric anal sphincter injury. In 30.3% of cases, newborns were large for gestational age. Gestational diabetes was found in 9.1% of OASIS cases, occipitoposterior position was found in 9.1% of cases. Induced labour took place in 39.4%, and oxytocin infusion was applied in 60.6% of OASIS cases. Vacuum extraction was performed in 12.1% of deliveries with OASIS. The average BMI in 3a and 3b injuries was 29.9. In 3c degree it was 28.0, and in the fourth degree, it was 32.1. In 27.0% of OASIS cases due to the extent of the injury surgeon engagement was necessary. When compared with vaginal deliveries in 2012 we found a significant increase in OASIS in primiparas, large for gestational age, occipitoposterior position, induced labour, vacuum extraction and hypertension ($P < 0.01$). There is also increased incidence of OASIS in episiotomy and oxytocin use group ($P < 0.05$).

CONCLUSION: Low incidence of OASIS in our department is a result of active management of delivery, manual perineal protection and timely episiotomy.

Introduction

Perineal trauma is often observed during the vaginal birth. It can occur spontaneously or secondarily as an extension to an episiotomy. Obstetric anal sphincter injury (OASIS) includes the third and fourth degree of perineal injury. The risk for OASIS is about 1% of all vaginal deliveries [1].

The third degree of perineal rupture is a partial or complete disruption of the anal sphincter and can include both external and internal sphincter. It can be divided in three groups: grade 3a (disruption up to 50% of external anal sphincter), grade 3b (disruption over 50% of external anal sphincter) and grade 3c (any disruption of external anal sphincter with disruption of internal anal sphincter) [1] [2]. The fourth degree includes injury of the perineum, external and

internal sphincter and rectum [1]. It also includes "buttonhole" tear, where sphincters are intact but rectal mucosa is injured [1] [2].

Risk factors for OASIS are birth weight over 4000 g, nulliparity, induced labour, prolonged second stage of labour, mothers' age, shoulder dystocia, medial episiotomy, vacuum extraction, posterior occipital position and delivery between 3 a.m. and 6 a.m [1] [3] [4]. Early complications of OASIS are tear disruption and purulent discharge [5] [6], while late complications include incontinence and fistulas [3] [7] [8]. Unrecognized and treated inadequately, OASIS could have serious consequences for women of reproductive age and can influence general health, social and psychological state and sex life [9] [10].

A four-year experience with OASIS at the University Hospital Center "Sestre Milosrdnice", Zagreb, Croatia is presented in this paper.

Material and Methods

This is a retrospective study on OASIS during the period 01.01.2010.-31.12.2013. At the University Hospital Center Sestre Milosrdnice, Zagreb, Croatia. Three groups of patients with OASIS were included in this study. Patients with partial sphincter rupture were included in the first group (grade 3a and 3b), patients with complete sphincter rupture were included in the second group (grade 3c), while the patients with sphincter rupture and rectum injuries were included in the third group (4th degree). Effects of parity, age, episiotomy, newborns weight, gestational diabetes, posterior occipital position, induced labour, infusion of oxytocin, vacuum extraction, body mass index (BMI), weight gain during pregnancy, shoulder dystocia, hypertension (essential or gestational), preterm birth, epidural analgesia, cigarette smoking and surgeon engagement on OASIS cases were analyzed by descriptive statistical methods.

These results were compared with data from all vaginal deliveries in 2012. This group did not include 5 women who had OASIS that year. We had 2416 vaginal deliveries of 3157 in total. The data were analysed by SPSS program.

Results

The total number of deliveries during the 4-year period was 12721, with 9748 vaginal deliveries and 33 cases of OASIS (0.34% of all vaginal deliveries).

Seven patients had partial rupture of the anal sphincter (21.2% of all OASIS cases), 21 women (63.6%) had a complete sphincter injury, while 5 of them had a fourth-degree perineal injury (15.2%). Two patients with fourth-degree perineal injury had "buttonhole" tear injury.

Almost all the patients with OASIS (87.9%) were primiparas (Table 1).

The average age of patients with partial rupture of anal sphincter was 32 years, the average age among patients with a complete rupture of anal sphincter 31 years, while the mean age among the patients with the fourth degree of perineal injury was 28.8 years. The incidence of episiotomies among women with a third and fourth degree of perineal injury was 57.6%. All the performed episiotomies were mediolateral. The incidence of episiotomies among patients with partial anal sphincter injuries had episiotomies was 42.9%, the incidence among patients with complete anal sphincter injuries was 61.9%, while the incidence among women with fourth-degree perineal injuries was 60%.

Table 1: OASIS group compared with vaginal deliveries in 2012

	OASIS		2012		χ^2 test
	N= 33 (%)	N= 2416 (%)			
Primiparas	29 (87.9)	1164 (48.2)			20.44; df=1; P < 0.01
Episiotomy	19 (57.6)	875 (36.2)			6.43; df=1; P < 0.05; P > 0.01
Large for gestational age	10 (30.3)	169 (7)			26.28; df=1; P < 0.01
Gestational diabetes	3 (9.1)	316 (13.1)			0.44; df=1; P > 0.01
Posterior occipital position	3 (9.1)	39 (1.6)			10.83; df=1; P < 0.01
Induced labour	13 (39.4)	449 (18.6)			9.18; df=1; P < 0.01
Oxytocin use	20 (60.6)	1042 (43.7)			3.99; df=1; P < 0.05; P > 0.01
Vacuum extraction	4 (12.1)	51 (2.1)			14.79; df=1; P < 0.01
Shoulder dystocia	0	3 (0.12)			0.04; df=1; P > 0.01
Hypertension	6 (18.2)	67 (2.4)			26.83; df=1; P < 0.01
Preterm labour	1 (3)	114 (4.7)			0.17; df=1; P > 0.01
Epidural analgesia	6 (18.2)	367 (15.2)			0.22; df=1; P > 0.01

Analyzing the risk factors for OASIS, some interesting results were obtained. About 30.3% of patients with OASIS have had babies large for gestational age. However, there were no newborns weighing more than 4500 grams. Gestational diabetes was found in 9.1% of OASIS cases, same as the posterior occipital position. Induced labour took place in 39.4%, and oxytocin infusion was applied in 60.6% of OASIS patients. Vacuum extraction was performed in 12.1% of deliveries with OASIS (Table 1). The average BMI in 3a and 3b injuries was 29.9.

Furthermore, in grade 3c the average BMI was 28.0, while the average BMI in the fourth degree of perineal injury was 32.07. Weight gain more than 14kg was observed in 57.6% of women with OASIS. However, shoulder dystocia was not recorded. About 6.1% of all the OASIS patients have had a delivery between 3 a.m. and 6 a.m. Hypertension disorder in pregnancy was found in 18.2% of cases, while the preterm birth occurred in 3% of OASIS patients. Epidural analgesia was applied in 18.2% (Table 1). Cigarette smoking was found in 9.1% of the patients with OASIS. The surgeon engagement was necessary in 27.0% of OASIS cases due to the extent of the injury.

When compared with vaginal deliveries in 2012 we found a significant increase in OASIS in primiparas, large for gestational age, occipitoposterior position, induced labour, vacuum extraction and hypertension (P < 0.01) (Table1). There is also increased incidence of OASIS in episiotomy and oxytocin use group (P < 0.05) (Table 1).

Discussion

Incidence of OASIS is in a wide range of 0.5-8% of vaginal deliveries [4] [5] [11] [12] [13]. Furthermore, there is an increase in OASIS incidence in last few decades [11] [14]. Low incidence (0.34%) in our research is a result of active labour management and practice of classical obstetrics. A special birthing chair for primiparas is not used in our Department, and a timely episiotomy is performed avoiding the medial episiotomy. Oxytocin infusion is

dosed in a way it does not influence the partogram. Line and all have clearly shown in their study that the incidence of OASIS varies in different countries and different obstetric schools. They found the incidence of OASIS in Finland to be only 0.6% and in Sweden 4.2% [11].

Primiparas have OASIS more often as compared to women who have previously given birth. We found that primiparae account for 87.9% of all OASIS cases. In the retrospective study conducted by Rizvi et al., it has been reported that 75% of primiparae were the patients within the OASIS group [12]. Other retrospective and prospective studies report similar results [4] [13].

There are reports that age influences incidence of OASIS especially ages over 35 years [1] [4], but our study failed to confirm these reports.

Medial episiotomy is a known risk factor for OASIS, and mediolateral episiotomy does not prevent anal sphincter injury [4]. In our Department, medial episiotomy is extremely rarely used. We use mediolateral episiotomy for every vacuum extraction for its known protective effect [15] [16]. However, there are some reports questioning the effects of episiotomy even in cases of instrumental delivery [17].

Newborns weight influences the incidence of OASIS [4] [13] [15] [18]. In our study, almost one-third of newborns had a weight greater than 90 percentile for gestational age. Reports suggest that foetal macrosomia is found in 12% of uncomplicated pregnancies [19]. In our study babies large for gestational age increase risk for the third and fourth degree of perineal injuries. Women with gestational diabetes often give birth to macrosomic newborns. Macrosomia increases risk of failure to deliver, and the need for instrumental delivery. If there is suspicion of a foetus weighing more than 5000g in non-diabetic mother or 4500 g in diabetic mother, the elective Caesarean section is recommended [20]. In our Department, the incidence of gestational diabetes does not vary in OASIS from that in general group. Incidence of gestational diabetes varies from 4-17.8% [21].

Although shoulder dystocia is a known risk factor for OASIS, our study failed to confirm these reports. The posterior occipital position was found to be tenfold then usually reported [22].

Labour induction and the use of oxytocin infusion during the labour vary in different countries and even within the country; hence the results of this study have not been compared with the literature. We compared OASIS cases with the representative control group from our Department that consists of all vaginal deliveries in a year 2012, when we had 18.6% of labour induction in vaginal deliveries ($\chi^2 = 10.04$, $df = 1$, $P < 0.01$) and 43.7% use of oxytocin infusion ($\chi^2 = 4.52$, $df = 1$, $P < 0.05$). The connection between the labour induction and OASIS is quite obvious.

It has been found that instrumental delivery increases the risk for OASIS in our study, as well as in the literature, especially if the forceps is used [2] [4] [12] [18]. However, forceps is never used in our obstetric Department.

The reports on the effect of increased body weight and BMI on OASIS are not quite clear in the literature [23] [25]. According to World Health Organisation, there are 3 categories of weight: normal weight is with BMI 18.5–24.9, overweight with BMI 25–29.9 and obese with BMI ≥ 30 [26]. We only found a connection between BMI and fourth degree of perineal injury, but we failed to demonstrate any connection with early morning hour delivery, which was reported in one study [4].

The incidence of gestational hypertension is 5-10% of all pregnant women [27]. We have found the increased percentage of gestational hypertension (18.2%) in OASIS cases. It is known that induced labour is more often among patients with hypertension. This could potentially explain the connection between gestational hypertension and OASIS [28].

Preterm labour occurs in 5-15% of deliveries; however, we have failed to find it as a risk factor for OASIS [29].

Epidural analgesia can prolong the second stage of labour, and this could be the reason for the increased risk of OASIS [30]. In our Department, we tolerate duration of the second stage of labour in parturient women who received the epidural analgesia up to three hours for nulliparous and two hours for multiparous women (one hour longer than the recommended duration of the second delivery stage) [31] [32]. In our study, the use of epidural analgesia is even less frequent than in the literature reports. Hence we did not find the increased risk for OASIS in epidural analgesia cases.

Cigarette smoking is a reason for decreased newborns weight. Hence, it could decrease the risk for OASIS [18] [28]. However, the percentage of cigarette smoking in our study was similar to the rest of Europe [33].

The efforts made to avoid OASIS are understandable considering the repercussions of such injuries. Perineal protection devices are designed to influence the elasticity of perineum. Lavesson et al., in a multicenter, open randomised controlled trial, used this device designed to protect perineum during the labour and did not found a significantly reduced incidence in perineal sphincter injury [34].

In cases when there was OASIS in a previous pregnancy, a careful assessment of the possibility of vaginal delivery is made in our Department. The most important criterion is the newborns' weight. If the newborns' weight is less than 4000 g and all the other criteria are met, a vaginal delivery is recommended.

In case of fourth-degree perineal injury, a Caesarean section is recommended. One retrospective study did not find that previous OASIS can influence the incidence of OASIS in later pregnancies. However, the incidence correlated with newborns' weight and instrumental delivery [35] [36].

Low incidence of OASIS found in our retrospective study is the result of active protection of the perineum and valid episiotomy indications. Lainie et al. found similar results in their study concluding that this could be the reason for the low incidence of OASIS in Finland compared with other Nordic countries [11] and one of the countries with the lower incidence OASIS is Romanian, with only 0.1% [37].

In our Department, a physician is present at every delivery. We practice perineal visualisation during the second stage of labour for a precise moment for an episiotomy. This accompanied by the manual perineal protection is crucial in perineal rupture prevention [13].

In cooperation with surgeons, we always practice primary suturing of the birth canal rupture. Short- and long-term results are better if experienced colorectal surgeon was part of the team [36].

In conclusion, low incidence of OASIS in our maternity unit is the result of the active manual protection of the perineum and valid episiotomy indications. Serious injuries of the birth canal are difficult to predict. It is important to follow the obstetric rules and to perform an episiotomy if indicated. An adequate inspection of the birth canal is necessary to detect third and fourth-degree perineal injury. The consequences for the wellbeing of a young mother with perineal injury can be serious and can affect social and sexual aspects of life. Adequate surgical treatment and postoperative care assure optimal results and prevent long-term complications like fistulas or faecal incontinence.

References

- Royal College of Obstetricians and Gynaecologists. The management of third- and fourth- degree perineal tears. (Green-top Guideline No.29), March 2007.
- Royal College of Obstetricians and Gynaecologists. The management of third- and fourth- degree perineal tears. (Green-top Guideline No.29), June 2015.
- Frohlich J, Kettle C. Perineal care. *BMJ Clin Evid.* 2015; 2015.
- Jander C, Lyrenas S. Third and fourth degree perineal tears. Predictor factors in a referral hospital. *Acta Obstet Gynecol Scand.* 2001; 80(3):229-34. <https://doi.org/10.1080/j.1600-0412.2001.080003229.x> PMID:11207488
- Buppasiri P, Lumbiganon P, Thinkhamrop J, Thinkhamrop B. Antibiotic prophylaxis for third- and fourth-degree perineal tear during vaginal birth. *Cochrane Database Syst Rev.* 2014; 10:CD005125. <https://doi.org/10.1002/14651858.CD005125.pub4>
- Fitzpatrick M, O'Herlihy C. Short-term and long-term effects of obstetric and sphincter injury and their management. *Curr Opin Obstet Gynecol.* 2005; 17:605-10. <https://doi.org/10.1097/01.gco.0000191901.69320.a0>
- Guise JM, Morris C, Osterweil P, Li H, Rosenberg D, Greenlick M. Incidence of fecal incontinence after child birth. *Obstet Gyn.* 2007; 109:281-8. <https://doi.org/10.1097/01.AOG.0000254164.67182.78> PMID:17267825
- LaCross A, Groff M, Smaldone A. Obstetric anal sphincter injury and anal incontinence following vaginal birth: a systemic review and meta-analysis. *J Midwifery Womens Health.* 2015; 60(1):37-47. <https://doi.org/10.1111/jmwh.12283> PMID:25712278
- Welwdji EP, Elong A, Verla V. Secondary repair of severe chronic fourth-degree perineal tear due to obstetric trauma. *J Surg Case Rep.* 2014; 2014(5). <https://doi.org/10.1093/jscr/riu034>
- Crawford LA, Quint EH, Pearl ML, DeLancey JO. Incontinence following rupture of the anal sphincter during delivery. *Obstet Gynecol.* 1993; 82(4Pt1):527-31. PMID:8377977
- Laine K, Gissler M, Pirhonen J. Changing incidence of anal sphincter tears in four Nordic countries through the last decades. *Eur J Obstet Gynecol Reprod Biol.* 2009; 146(1):71-5. <https://doi.org/10.1016/j.ejogrb.2009.04.033> PMID:19482405
- Rizvi RM, Chaudhury N. Practices regarding diagnosis and management of third and fourth degree perineal tears. *J Pak Med Assoc.* 2008; 58(5):244-7. PMID:18655400
- Samuelsson E, Ladfors L, Wennerholm UB, Gareberg B, Nyberg K, Hagberg H. Anal sphincter tears: prospective study of obstetric risk factors. *BJOG.* 2000; 107(7):926-31. <https://doi.org/10.1111/j.1471-0528.2000.tb11093.x> PMID:10901566
- Lindgren HE, Brink A, Klinberg-Allvin M. Fear causes tears-perineal injuries in home birth settings. A Swedish interview study. *BMC Pregnancy Childbirth.* 2011; 11:6. <https://doi.org/10.1186/1471-2393-11-6> PMID:21244665 PMCid:PMC3034711
- Guroi-Urganci I, Cromwell DA, Edozien LC, Mamhood TA, Adams EJ, Richmond DH, Templeton A, van der Meulen JH. Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012. Time trends and risk factors. *BJOG.* 2013; 120(12):1516-25. <https://doi.org/10.1111/1471-0528.12363> PMID:23834484
- Jango H, Langhoff-Roos J, Rosthoj S, Sakse A. Modifiable risk factors of obstetric anal sphincter injury in primiparous women: a population-based cohort study. *Am J Obstet Gynecol.* 2014; 210(1):59.e1-6. <https://doi.org/10.1016/j.ajog.2013.08.043> PMID:23999415
- Amorim MM, Franca-Neto AH, Leal NV, Melo FO, Maia SB, Alves JN. Is it possible to never perform episiotomy during vaginal delivery? *Obstet Gynecol.* 2014; 123(Suppl 1):38S. <https://doi.org/10.1097/01.AOG.0000447314.51968.54>
- McPherson KC, Beggs AD, Sultan AH, Thakar R. Can the risk of obstetric anal sphincter injuries (OASIs) be predicted using a risk-scoring system? *BMC Res Notes.* 2014; 7:471. <https://doi.org/10.1186/1756-0500-7-471> PMID:25056485 PMCid:PMC4119183
- Kc K, Shakya S, Zhang H. Gestational diabetes mellitus and macrosomia: a literature review. *Ann Nutr Metab.* 2015; 66(Suppl 2):14-20. <https://doi.org/10.1159/000371628> PMID:26045324
- Vraneš HS, Djaković I. Length and weight of newborns in Croatia from 1985 to 2009. *Wien Klin Wochenschr.* 2015; 127(17-18):685-690. <https://doi.org/10.1007/s00508-014-0686-2> PMID:25576333
- Đelmiš J, Ivanišević M, Juras J, Herman M. Diagnosis of hyperglycemia in pregnancy. *Gynecol Perinatol.* 2010; 19(2):86-9.
- Kuvacic I, editor. *Porodništvo.* Zagreb: Medicinska Naklada, 2009:456-7. [Croatian]
- Usha Kiran TS, Hemmati S, Bethel J, Evans J. Outcome of pregnancy in a woman with an increased body mass index. *BJOG.*

- 2005; 112(6):768-72. <https://doi.org/10.1111/j.1471-0528.2004.00546.x> PMID:15924535
24. Voldner N, Frosli KF, Haakstad LA, Bo K, Henriksen T. Birth complications, overweight, and physical inactivity. *Acta Obstet Gynecol Scand.* 2009; 88(5):550-5. <https://doi.org/10.1080/00016340902818162> PMID:19277916
25. Blomberg M. Maternal body mass index and risk of obstetric anal sphincter injury. *Biomed Res Int.* 2014; 2014:395803. <https://doi.org/10.1155/2014/395803> PMID:24839604 PMID:PMC4009284
26. WHO, Obesity: Preventing and Managing the Global Epidemic, vol. 894 of WHO Technical Report Series, World Health Organization, Geneva, Switzerland, 2000.
27. Klocek M, Czarnecka D. Hypertension during pregnancy- how to manage effectively? *Przegl Lek.* 2015; 72(4):200-4. [Polish] PMID:26455020
28. Hudelist G, Gelle'n J, Singer C, Ruecklinger E, Czerwenka K, Kandolf O et al. Factors predicting severe perineal trauma during childbirth: role for forceps delivery routinely combined with mediolateral episiotomy. *Am J Obstet Gynecol.* 2005; 192(3):875-81. <https://doi.org/10.1016/j.ajog.2004.09.035> PMID:15746685
29. Kuvacic I, editor. *Porodništvo.* Zagreb: Medicinska Naklada, 2009:323-32. [Croatian]
30. Carroll TG, Engelken M, Mosier MC, Nazir N. Epidural analgesia and severe perineal laceration in a community-based obstetric practice. *J Am Board Fam Pract.* 2008; 16(1):1-6. <https://doi.org/10.3122/jabfm.16.1.1>
31. Bilić N, Djaković I, Kličan-Jajić K, Sabolović Rudman S, Ivanec Ž. Epidural Analgesia in Labor – Controversies. *Acta Clin Croat.* 2015; 54(3):330-6. PMID:26666104
32. ACOG Committee Opinion 295: Pain relief during labor. *Obstet Gynecol* 2004; 104(1):213. <https://doi.org/10.1097/00006250-200407000-00061>
33. Banderali G, Martelli A, Landi M, Moretti F, Betti F, Radaelli G et al. Short and long term health effects of parental tobacco smoking during pregnancy and lactation: a descriptive review. *J Transl Med.* 2015; 13(1):327. <https://doi.org/10.1186/s12967-015-0690-y> PMID:26472248 PMID:PMC4608184
34. Lavesson T, Griph ID, Skarvad A, Karlsson AS, Nilsson HB, Steinvall M, Haadem K. A perineal protection device designed to protect the perineum during labor: a multicenter randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol.* 2014; 181:10-4. <https://doi.org/10.1016/j.ejogrb.2014.07.006> PMID:25126978
35. Boggs EW, Berger H, Urquia M, McDermott CD. Recurrence of obstetric third-degree and fourth-degree anal sphincter injuries. *Obstet Gynecol.* 2014; 124(6):1128-34. <https://doi.org/10.1097/AOG.0000000000000523> PMID:25415164
36. McNikol FJ, Bruce CA, Chaudhri S, Francombe J, Kozman E, Taylor BA, Tighe MJ. Management of obstetric anal sphincter injuries- a role for the colorectal surgeon. *Colorectal Dis.* 2010; 12(9): 927-30. <https://doi.org/10.1111/j.1463-1318.2009.01897.x> PMID:19508524
37. Blondel B, Alexander S, Bjarnadóttir RI, Gissler M, Langhoff-Roos J, Novak-Antolič Ž, et al. Variations in rates of severe perineal tears and episiotomies in 20 European countries: a study based on routine national data in Euro-Peristat Project. *Acta Obstet Gynecol Scand.* 2016; 95(7):746-54. <https://doi.org/10.1111/aogs.12894> PMID:26958827