

ORIGINAL RESEARCH ARTICLE

Obstructed Labour in Resource-poor Settings: The Need for Revival of Symphysiotomy in Nigeria

Emmanuel Monjok*^{1, 2, 6}, Ita B. Okokon^{2, 6}, Margaret M. Opiah^{3, 6}, Justin A. Ingwu^{4, 6}, John E. Ekabua⁵, Ekere J. Essien¹

¹ University of Houston, Institute of Community Health, Texas Medical Center, Houston, Texas, USA; ²Department of Family Medicine, College of Medical Sciences, University of Calabar, Nigeria; ³Department of Maternal and Child Health, Faculty of Nursing, Niger Delta University, Bayelsa State, Nigeria; ⁴Department of Nursing, Faculty of Health Science and Technology, University of Nigeria, Enugu campus, Nigeria; ⁵Department of Obstetrics and Gynaecology, College of Medical Sciences, University of Calabar, Nigeria; ⁶Sacred Heart Roman Catholic Hospital, Obudu, Cross River State, Nigeria

*For correspondence: Email: emonjok@uh.edu Tel: (713)795 8321

Abstract

Symphysiotomy is an operation in which the fibres of the pubic symphysis are partially divided to allow separation of the joint and thus enlargement of the pelvic dimensions thereby facilitating vaginal delivery of the foetus in the presence of mild to moderate cephalopelvic disproportion. It is performed with local anaesthesia, does not require an operating theatre or advanced surgical skills. It can be a lifesaving procedure for both mother and baby in obstructed labour, especially in rural areas and resource-poor settings of developing countries, where a 24 hours availability of a caesarean section cannot be guaranteed. It is a simple underused technology that can be performed by a graduate doctor or midwife in rural health facilities and hospitals where most of the times, in Nigeria, there are no practicing specialist obstetricians. In rural hospital and in communities where symphysiotomy is still being performed, it is evident that it is preferred to caesarean section because of the socio-cultural desire to achieve a vaginal delivery. This paper highlights our experiences with symphysiotomy in a rural Roman Catholic hospital providing evidence on the safety of symphysiotomy and the need for its revival and reinstatement in the obstetric arsenal in Nigeria and similar countries in sub-Saharan Africa where maternal mortality as a result of prolonged and neglected obstructed labour still occur (*Afr J Reprod Health 2012; 16[3]: 93-100*).

Résumé

Symphysiotomie est une opération dans laquelle les fibres de la symphyse pubienne sont partiellement divisées pour permettre la séparation de l'articulation et permet en conséquence l'élargissement commune et des dimensions du bassin, facilitant ainsi l'accouchement vaginal des fœtus en présence d'une disproportion céphalo-pelvienne d'intensité légère à modéré. Elle est réalisée sous l'anesthésie locale, et n'exige pas une salle d'opération ou des compétences chirurgicales avancées en chirurgie. Elle peut être une procédure de sauvetage pour la mère et le bébé dans les dystocies, surtout dans les zones rurales dont les ressources sont limitées des pays en développement, où une opération césarienne ne peut être assurée pour 24 heures par jour. C'est est une technologie simple qui est sous-utilisés et qui peuvent être pratiquée par un médecin qualifié ou une sage-femme dans les établissements de santé ruraux et les hôpitaux où la plupart du temps, au Nigeria, il n'y a pas d'obstétriciens spécialisés exerçant. Dans les hôpitaux ruraux et dans les communautés où la symphysiotomie est toujours pratiquée, il est évident qu'il est préférable à l'opération césarienne en raison de la volonté socioculturelle pour parvenir à un accouchement vaginal. Cet article met en lumière nos expériences avec la symphysiotomie dans un hôpital rural catholique romain et fournit des preuves sur la sécurité de la symphysiotomie et la nécessité de sa renaissance et de sa réintégration dans l'arsenal obstétrique au Nigeria et les pays similaires en Afrique sub-saharienne où la mortalité maternelle se produire toujours à cause de la dystocie prolongée et négligée (*Afr J Reprod Health 2012; 16[3]: 93-100*).

Keywords: Obstructed Labour, cephalo-pelvic disproportion, symphysiotomy, resource-poor communities, Nigeria.

Introduction

The high levels of maternal mortality in Nigeria remain a challenge and a major public health

problem. In 2005, WHO estimates of maternal mortality for Nigeria was 1,100 deaths per 100,000 live birth¹. Recent global population estimates of maternal mortality shows a relative decline in

global statistics but Nigeria is one of the six countries contributing more than 50% of all maternal mortality in 2008². Although WHO estimates of maternal mortality for 2011 was 840 deaths per 100,000³, health facility data still indicate very high maternal mortality ratio greater than 1500 per 100,000 live births^{4,5}. This makes Nigeria one of the countries with the most serious maternal mortality crisis in the world. In recognition of the high levels of maternal death and the huge disparities between the developed and developing nations, the United Nations in 2000 endorsed a set of far-ranging Millennium Development Goals (MDG). The number 5 goal set a target of a 75% reduction in each country's maternal mortality ratio (MMR) by 2015. The likelihood of Nigeria reaching that goal is doubtful.

The major causes of maternal death are preventable. The causes are direct or indirect. In Nigeria, the direct causes which are the major implicated factors have been identified to occur in this order of decreasing frequency; obstetric hemorrhage, sepsis (abortion), toxemia of pregnancy, obstructed labour and anemia^{4,6}. The indirect causes are those that result from pre-existing diseases or diseases that develop during pregnancy and were not due to the direct obstetric causes. HIV/AIDS, pulmonary tuberculosis, malaria, viral hepatitis, sickle cell disease etc. are some of these causes in Nigeria^{2,3}. There are so many other avoidable factors which have to do with social, cultural, economic, administrative, educational, and complex infrastructural and political issues that interplay with the community to contribute to this unfortunate tragedy in Nigeria. Therefore the MMR of any nation reflects not only the adequacy of obstetric care but also the level of socio-economic development of the country⁷. Mechanical obstruction in the second stage complicates about 1-2% of labours⁸. The World Health Organization (WHO) estimates annual global obstructed labour-related maternal mortality at 50,000⁹. This does not include cases of prolonged labour which leads to life-long morbidities to both mother and child. One significant and unfortunate complication of both prolonged labour and obstructed labour is vesicovaginal fistula (VVF). The United Nations

Population Fund (UNFPA) estimates that there are about 2 million women living with VVF, most of them in sub-Saharan Africa¹⁰. Obstructed labour is therefore a significant cause of maternal morbidity in Nigeria and many other resource-poor areas of the world. It is also in these resources constrained areas of the world that a 24 hours availability of a caesarean section cannot be guaranteed, especially in the rural areas where majority of the population resides.

The caesarian section rate in almost all health facilities in Nigeria is on the increase. This is also the trend in other developing and developed countries of the world. There is therefore a global call to reduce the current high caesarean section rate¹¹. In the developed world, where there is a low prevalence of obstructed labor; the likelihood of having a prolonged/obstructed labour leading to maternal death is almost non-existent. There is, in addition little aversion to caesarean delivery and caesarean delivery is relatively safe in developed countries. For these reasons, the minimally invasive symphysiotomy procedure has been abandoned in these countries. However, developing countries are still characterized by high maternal morbidity and mortality from obstructed labour and a cultural dislike for caesarean delivery¹². Furthermore, some cultures still regard abdominal delivery as a reproductive failure with some degree of social stigmatization¹³. This fear of caesarean section has led many women with known operative indications or after a previous caesarean section scar, to attempt vaginal delivery outside the hospital setting with resultant maternal and foetal deaths as well as other severe complications¹⁴. In addition, caesarean section still carries a significant risk to the mother and child and a maternal mortality rate of 1-2% has been reported in Nigeria^{15, 16}. For these reasons, symphysiotomy has been advocated for the management of CPD in resource-poor settings^{12-14, 17, 18}.

Symphysiotomy

Symphysiotomy is an operation to widen the maternal pelvis by dividing the fibro-cartilage of the symphysis pubis, thereby facilitating vaginal delivery of the fetus in the presence of mild to moderate cephalopelvic disproportion¹⁹. A review

of 5,000 symphysiotomies shows that it has no greater risk than caesarean section and is a much simpler and less expensive procedure²⁰. In remote health facilities where anaesthetic and blood transfusion services are not readily available and where women with prolonged obstructed labour are likely to present in a severely compromised and moribund state, symphysiotomy provides the only hope of saving the mother and baby²¹. Symphysiotomy is also a life-saving intervention in cases of trapped after-coming head of the baby in vaginal breech delivery and shoulder dystocia^{21, 22}. Symphysiotomy is a very simple procedure making it easier to apply the principle of task-shifting to non-specialist doctors and experienced midwives especially in peripheral health facilities where specialist obstetricians are not readily practicing. The procedure is not done in any Nigerian tertiary and specialist hospitals. It is however still being practiced in certain missionary hospitals by European missionary doctors and their trained Nigerian doctors^{13, 23}. Studies have shown that symphysiotomy is preferred to caesarean section in those communities in Nigeria where European missionary doctors and trained Nigerian doctors continue to practice the procedure^{12, 24}. A recent review by Hofmeyr and Shweni²⁵ has shown that symphysiotomy has several advantages over caesarean section. (See below).

Advantages of symphysiotomy²⁵

1. *It is more rapid to perform.*
2. *It is simple.*
3. *It can be performed by health workers without formal training in laparotomy skills.*
4. *Only local analgesia is used.*
5. *No operating theatre, anaesthetist, electricity or sophisticated equipment is needed.*
6. *There is no risk of scarred uterus in subsequent pregnancies, particularly when women may not in future have ready access to caesarean section.*
7. *It may be life-saving for the breech baby with entrapped after-coming head and possibly in shoulder dystocia.*
8. *It may be preferred in cultures in which caesarean section is viewed as a personal failure on the part of the woman.*

9. *It results in a permanent enlargement of the pelvis.*

10. *Use of symphysiotomy reduces the caesarean section rate.*

Disadvantages of symphysiotomy²⁵

1. *For birth of the baby the cervix must be fully dilated or progress to full dilatation.*
2. *It is contraindicated in the presence of gross disproportion e.g. in hydrocephaly.*
3. *It may rarely be associated with morbidity such as pelvic pain and instability.*
4. *Other complications include vaginal lacerations; haematuria(blood in urine); wound infection; urinary incontinence; and vesico-vaginal fistula(a track between the bladder and the vagina). Necrosis of the urethra and bladder neck have been described following symphysiotomy, though the fact that in all cases the baby had died prior to the procedure suggested that pressure necrosis from prolonged obstructed labour may have been the cause.*

Symphysiotomy in practice at Sacred Heart Hospital, Obudu

Sacred Heart Hospital (SHH), Obudu is a rural 250-bed Roman Catholic Missionary hospital. It was very popular in the resource-poor communities of approximately 1 million people in the northern part of Cross River State, southern part of Benue State and south west region of Cameroon. The hospital was built in 1950 by Irish medical missionary of Mary (MMM). Symphysiotomy procedure was discontinued in 1990 with the exit of the medical missionaries, and the trained Nigerian doctors, when the hospital was officially handed over to the Roman Catholic Diocese of Ogoja. The procedure was performed for mild-moderate cephalopelvic disproportion with delivery of the head assisted with the vacuum extractor. It was also indicated in primigravidae with breech presentation in labour to prevent entrapment of the after-coming head. The other criteria for selection was alive fetus, advanced cervical dilatation, and a well engaged fetal head, $\leq 3/5^{\text{th}}$ head palpable per abdomen.

It was a popular procedure among the women in Obudu who preferred it to caesarean section and

referred to it in the local language (Bete) as “operation to open the waist”. It was affordable, accepted, with minimal cost to the patients and with minimal post-operative complications.

Symphysiotomy procedure^{19, 23, 25, 26}

The procedure was carried out in the labour ward in the second stage of labour. The patient is placed in dorsal position with two assistant/nurse aid supporting the patient legs with her thigh in abduction (not more than 45 degrees) and knees flexed (Fig1). Local anesthesia of about 10mls of 0.5% lignocaine is injected subcutaneously over the symphysis and in the connecting fibers between the pubic bones (fibrocartilage). A similar amount of local anesthesia is also injected in the area of the perineum where the episiotomy would be made. A Foleys catheter is inserted into the urethra. With the index finger and middle finger of the non-dominant hand in the vagina, the urethra is shifted to the side away from the midline. With the other hand, a symphysiotomy knife (Zarate) is used to make a vertical stab incision over the symphysis (Fig 2). Using the upper third of the uncut fibrocartilage as a fulcrum, the knife is levered to incise the lower two-thirds of the fibrocartilage. The division is kept strictly to the midline to avoid damage to the hyaline cartilage.

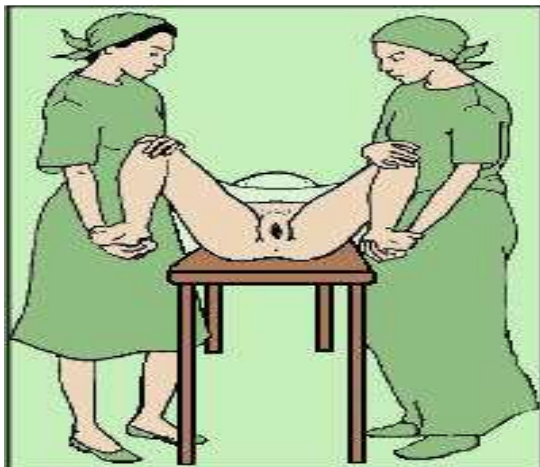


Fig I. POSITION OF WOMAN FOR SYMPHYSIOTOMY PROCEDURE.³⁰

Once the fibrocartilage has been divided through the whole length, the pubic bones will separate, which can be felt with experience. With increasing uterine contraction, maternal bearing down and pressure from the foetal presenting part against the pelvic wall, there is a widening of the symphysis pubis by about 2.5 cm. This causes a 20-25% increase in the dimensions of both the pelvic inlet and outlet, especially the outlet diameters. A generous medio-lateral episiotomy is performed. The baby is delivered by vacuum extraction. During the delivery of the head, the two assistant put the two knees together to prevent further symphyseal separation. The bladder is drained by connecting the Foleys catheter to a bladder bag for continuous bladder drainage. The stab wound is closed with one suture and dressed with iodine dressing. The episiotomy wound is also closed. The entire operation normally last about 5minutes. The instruments needed for symphysiotomy is shown in Fig 3.

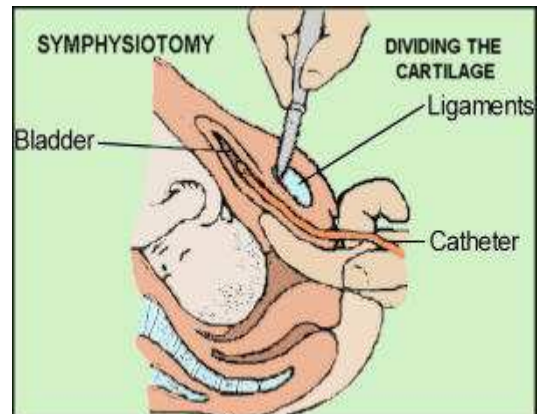


Fig 2 SYMPHYSIOTOMY PROCEDURE: DIVIDING THE SYMPHYSIS PUBIS.³⁰

Post-procedure care

The knees are strapped with elastic strappings. The two iliac crests are also strapped with elastic bandaging to stabilize the symphysis and reduce movement and pain. Antibiotics (crystalline penicillin 1gm and gentamycin, 80mg) are given intravenously, pentazocine 30mg intramuscularly, followed by oral cotrimoxazole and metronidazole. Analgesics (oral paracetamol) are



Fig 3 EQUIPMENTS FOR SYMPHYSIOTOMY PROCEDURE, SACRED HEART HOSPITAL, OBU DU

also given. The patient is nursed on a low level bed with the indwelling urethral Foley's catheter for four days with both lower limbs strapped together. Mobilization with the aid of crutches begins on the 5th day post-procedure or when the catheter is removed. This however depends on the ability of the woman. The patients were normally discharged by the 7th post-operative day, but some patients may stay as long as 10-14 days if the urine is blood stained or the mobilization has been deemed inadequate. The women were advised to avoid wide abduction of the thighs postpartum for about 3-6 months, avoid heavy lifting and fetching water, climbing hills etc, and to seek early hospital appointment if there is difficulty or pain on walking.

Symphysiotomy experience at SHH: Data analysis.

During our 6-year period (1984-1989) at SHH, a total of 36 symphysiotomies were performed and 9,138 deliveries were conducted, giving a symphysiotomy rate of 0.39. The procedure was commonly done on nulliparous women (Table I). The main indications for symphysiotomy (Table

II) were mild-moderate CPD (86.1%), previous caesarean section with mild CPD (8.3%) and arrest of after-coming head (5.6%) Maternal complications encountered (Table III) were postoperative pelvic and leg pain (72.2%), failed symphysiotomy(8.3%), wound infection (5.6%), bleeding (5.6%), stress incontinence (5.6%) and hematoma (2.7%), There were no cases of VVF, vaginal lacerations or gait abnormalities. Thirty five (35) babies were delivered alive with one (1) fresh stillbirth. (Table IV). There were no cases of maternal death arising from the procedure. There were five (5) maternal deaths recorded during the study period (1984-1989), four (4) were due to septic abortion, and one (1) from postpartum haemorrhage, giving a MMR of 54.7 per 100,000 live births.

The pubic hematoma was managed with drainage and analgesics. The primary haemorrhage from the stab pubic incision was managed by deep suturing and pressure bandaging. Wound infection was managed with antibiotics. The failed symphysiotomies were delivered by emergency caesarean section. The patients were followed up in the postnatal clinic but most of them never return to the clinic after one or two visits especially when they do not suffer any discomfort.

Table I Distribution of Symphysiotomy cases by parity, Sacred Heart Hospital Obudu: 1984-1989.

Parity	Total No. of deliveries	No. of symphysiotomy	Symphysiotomy rate/parity	Symphysiotomy/Total delivery
0	1,963	20	1.01	0.21
1-4	5,675	12	0.21	0.13
5+	1,500	4	0.27	0.05
Total	9,138	36		0.39

Table II Maternal indications for Symphysiotomy, Sacred Heart Hospital, Obudu: 1984-1989.

Indication	No.	of percentage cases
Cephalopelvic disproportion(CPD)	31	86.1
Previous caesarean section with mild CPD	3	8.3
Arrest of after coming head	2	5.6
Total	36	100

Table III Maternal complications of symphysiotomy, Sacred Heart Hospital, Obudu: 1984-1989.

Complication	No.	percentage
Post-operative pain(transient pelvic and leg pain)	26	72.2
Failed symphysiotomy	3	8.3
Wound infection	2	5.6
Bleeding	2	5.6
Stress incontinence	2	5.6
Hematoma	1	2.7
Total	36	100

Table IV Perinatal outcome of Symphysiotomy, Sacred Heart Hospital, Obudu: 1984-1989

Outcome	No.	percentage
Still birth(fresh)	1	2.8
Early Neonatal deaths	0	0
Alive births	35	97.2

Discussion and conclusion

Symphysiotomy at SHH, from our experience, is a safe procedure and without any adverse post-operative complications. Transient pelvic and leg pain was the common post-operative maternal complication encountered, which is similar to other observational studies^{23, 26, 27}. However, the symptoms of pain discomfort and walking usually subsides gradually by 3-4 weeks and maximally by 6-8 weeks²⁶⁻²⁸. Studies that have indicated adverse complications like VVF, maternal and neonatal deaths, also noted that most of these complications were not as a result of the symphysiotomy procedure, but were complications of neglected infected prolonged and obstructed labour presenting late to the hospital^{25, 27}. There are no reported cases of maternal mortality directly related to symphysiotomy to date in the later part of the 20th century and in the era of antibiotics^{20, 25}, indicating that this procedure is safe, especially in well trained hands and with good indications^{20,23,27,29}.

Sacred Heart Hospital in Obudu has developed a long and comfortable relationship with the

catchment communities, the trained traditional birth attendants (TBA) in the communities, the government peripheral maternity health centers and the few private medical practitioners, in such a manner that cases of difficult labour are referred and transported early to the hospital. This accounted for the very low incidence of obstructed labour presenting with complications at SHH. The family medicine resident doctors and generalist medical officers that worked in the hospital were trained by the Rev Sister surgeon or the Chief Medical Officer; so there were many skilled birth attendants with symphysiotomy skills available in the hospital in a 24 hours, 7 days a week period. Unfortunately, with the exit of the missionary doctors and the trained Nigerian doctors, this procedure has been discontinued since 1990.

The revival of this minimally invasive procedure in resource-poor setting in Nigeria will contribute to the reduction in caesarean section rate¹⁸ and increase hospital delivery without the fear of a caesarean section,²⁵ which is still viewed as a reproductive failure in these rural communities in Nigeria. This procedure is simple; making training and task shifting to junior medical doctors, general practitioners, and experienced midwives easy. Many specialist obstetricians and family physicians in Nigeria have not been trained in symphysiotomy, so it is necessary to incorporate this training in the postgraduate residency training programmes to prevent loss of skill. It is of particular importance for family physicians and general practitioners since these categories of doctors are the frontline practitioners in the district hospitals and primary health/maternity centres in Nigeria. Undergraduate Medical school and Nursing/Midwifery school curriculums in Nigeria should teach medical and midwifery students respectively on the use of symphysiotomy in the management of second stage of labour. It is advocated that all House Officers (interns) and graduating midwives in Nigeria should be trained in symphysiotomy so that it becomes part of the routine labour ward skills in the same way episiotomy and episiotomy repair has become in most peripheral hospitals in Nigeria.

In conclusion, symphysiotomy is one simple underused and alternative technology that can save the lives of women with obstructed labour and its

sequelae, such as uterine rupture, sepsis, and neonatal mortality and morbidity.²⁵ Symphysiotomy training can be offered and performed by a graduate doctor or a trained midwife/nurse, because of the non-availability of specialist obstetricians in rural areas of Nigeria. It is a simple and quick procedure requiring few instruments and no operating theatre. It does not carry the risk of a scarred uterus when the woman may not have readily access to a caesarean section in subsequent pregnancy. It fulfills the socio-cultural need to achieve a vaginal delivery in communities in which caesarean section is regarded as a reproductive failure. It leads to an enlargement of the pelvic dimensions, with the possibility of reducing the risk for further obstructed labour. With all these advantages, symphysiotomy should be revived, reinstated and given a better reputation in the obstetric arsenal in Nigeria and in other similar resource-poor countries in sub-Saharan Africa. We believe that it would contribute to the reduction in maternal mortality due to obstructed labour in Nigeria, a country which unfortunately has one of the highest maternal mortality ratios in the world. Long term cohort and focus group discussion studies are needed in these communities to document any long term orthopedic and gait complications.

Contribution of authors

Emmanuel Monjok(EM) and Ita B. Okokon(BO) conceived the idea, analyzed data, performed reviews and literature search and wrote the manuscript. Margaret M. Opiah (MMO) and Justin A. Ingwu (JAI) collected the data from the hospital records, arranged the symphysiotomy instruments and took the photographs. They were also involved in data analysis and manuscript reviews. John E. Ekabua (JEE) and Ekere J. Essien (EJE) were responsible for literature search and article retrieval, as well as contributing in the review, writing, analysis and interpretation of data. All authors read and approved the final manuscript.

Acknowledgements

The authors acknowledge Dr Stephen Bassey, Medical Superintendent of Sacred Heart Hospital, Obudu and the clerical staff of the medical records office of the hospital, for their assistance.

References

- WHO 2005. Maternal Mortality in 2000. Estimates developed by WHO, UNICEF, and UNFPA. Geneva. WHO 2005.
- Hogan, MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM et al. Maternal Mortality for 181 countries, 1980-2008: a systemic analysis of progress towards Millennium Development Goal 5. *Lancet* 2010; 8; 275(9726): 1609-1623.
- WHO 2011. World Health Statistics 2011. Part 1. Health-Related Millennium Development Goals.
- Onakewhor JUE, Gharoro EP. Changing Trends in Maternal Mortality in a developing country. *Nigerian Journal of Clinical Practice* 2008; 11(2): 111-120.
- Agan TU, Archibong EI, Ekabua JE, Ekanem EI, Abeshi SE, Edentekhe TA, Bassey EE. Trends in Maternal Mortality at University of Calabar Teaching Hospital, Nigeria, 1999-2009. *Int. J. Women's Health* 2010; 2: 249-254.
- Ujah LAO, Aisien OA, Mutahir JT, Vanderjagt DJ, et al. Factors Contributing to Maternal Mortality in North-Central Nigeria: A Seventeen-year Review. *African Journal of Reproductive Health* 2005; 9(3): 27-40
- Gwyneth Lewis. Maternal Mortality in the developing world: Why do mothers really die? *Obstetric Medicine* 2008; 1: 2-6.
- Dolea C, Abouzahr C. Global burden of Obstructed labour in the year 2000. Evidence and information for policy (EIP). Geneva: WHO 2003.
- WHO: Reduction of maternal mortality. A joint WHO/UNFPA/UNICEF/World Bank statement. Geneva: WHO, 1999.
- UNFPA: http://www.endfistula.com/fast_facts.htm. Accessed January 12, 2010.
- Robson MS. Can we reduce the caesarean section rate? *Best Practices & Research Clinical Obstetrics and Gynaecology* 2011; 15(1):179-194
- Onah HE. Formal education does not improve the acceptance of caesarean section among pregnant Nigerian women. *Int. J. Gynecol Obstet* 2002; 76: 321-323.
- Ezegwi HU, Olomu OO, Twomey ED. Symphysiotomy in a Nigerian Hospital. *Int. J. Gynaecol Obstet* 2004; 85: 272-273.
- Onah HE, Nkwo PO. Caesarean section or symphysiotomy for obstructed labour in the developing countries? Need to ascertain women's preferences. *J Obstet Gynaecol* 2003; 23: 594-595.
- Okonofua FE, Makinde ON, Ayangode SO. Yearly trends in caesarean section and caesarean mortality at Ile-Ife, Nigeria. *Trop J Obstet Gynaecol* 1998; 1: 31-35.
- Ojo VA, Adetoro OO, Okwerekwu FEO. Characteristics of maternal deaths following caesarean sections in a developing country. *Int. J. Obstet Gynaecol* 1988; 27: 171-176.
- Liljestrand J. The value of symphysiotomy. *BJOG: an International journal of Obstetrics and Gynaecology* 2002; 109: 225-226.
- Nkwo PO, Onah HE. Does a preference for symphysiotomy over caesarean section reduce the operative delivery rate? *Trop Doc* 2009; 29: 198-200.
- Verkuyl DAA. Think Globally Act Locally: The case for symphysiotomy. *PLoS medicine* 2007; 4(3): e71. doi: 10.1371/journal.pmed.0040071.
- Bjorklund K. Minimally invasive surgery for obstructed labour: a review of symphysiotomy during the twentieth century (including 5000 cases). *BJOG: an International Journal of Obstetrics and Gynaecology* 2002; 109: 236-248.
- Hofmeyr GJ. Obstructed labour: using better technologies to reduce mortality. *Int J Gynaecol Obstet* 2004; 85 Suppl. 1: S62-S72.
- Van Roosmalen J. Entrapment of the foetal head and symphysiotomy. *Trop Doc* 1993; 24: 168-172.
- Sunday-Adeoye IM, Okonta P, Twomey D. Symphysiotomy at the Mater Misericordiae Hospital Afikpo, Ebonyi State of Nigeria (1982-1999): a review of 1013 cases. *J Obstet Gynaecol* 2004; 24(5): 525-529.
- Onah HE, Ugonna MC. Preferences for caesarean section or symphysiotomy for obstructed labour among Nigerian Women. *Int. J. Gynaecol. Obstet* 2004; 84: 79-81.
- Hofmeyr GJ, Shweni PM. Symphysiotomy for fetopelvic disproportion. *Cochrane Database of Systemic Review* 2010. 10: CD005299
- Basak S, Kanungo S, Majhi C. Symphysiotomy: Is it obsolete? *J. Obstet. Gynaecol. Res* 2011; 37(7): 770-774
- Nwocha GC, Umezurike CC. Symphysiotomy-a dying art: the experience at Federal Medical Center, Umuahia, Nigeria. *Niger. Postgrad. Med, J* 2011; 18(2): 126-129.
- Bergstrom S, Lublin H, Molin A. Value of symphysiotomy in obstructed labour management and follow-up of 31 cases. *Gynecologic and Obstetric Investigation* 1994; 38: 21-35.
- Verkuyl DA, Ersdal HI, Raasen TJ. Absence of proper training in symphysiotomies resulted in this operation being underused, performed when contraindicated and possibly in a specific kind of urinary fistula. *Acta Obstetrica et Gynecologica Scandinavica* 2008; 87(2): 1380-1383.
- Symphysiotomy illustrations (Fig1 and Fig 2): MoonDragon's Obgyn women's information/procedures. Available at: www.moondragon.org/obgyn/procedures/5. Accessed 2012, Jan 17.