

**Breech deliveries in Tygerberg academic
hospital: maternal and neonatal outcomes of
vaginal and abdominal deliveries – a case-
controlled study**

by
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“Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree.

Signature:

Date:”

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Abstract

The Objective: To review the difference in short term neonatal and maternal outcomes among singleton infants with breech presentation delivered by vaginal or elective caesarean section route at term, at Tygerberg Academic Hospital (TBH) in Cape Town.

The study design was a retrospective case control study.

Method:

Part I

A total of 120 patients were selected. 60 vaginal breech deliveries and 60 elective caesarean sections for breech presentation (comprising the control group). 60 cases of vaginal deliveries were collected and 60 control cases of planned elective caesarean sections, where the indication for CS was breech presentation, were collected in the same manner.

Part II

Nineteen registrars completed a questionnaire regarding their subjective experiences of vaginal breech deliveries at Tygerberg Academic Hospital.

Results:

Part I

An analysis of the results found statistically significant differences in maternal ages between the two groups, with younger women delivering by CS; gravidity and parity was lower in the CS group; blood loss was observed to be higher in the CS group with more women requiring a blood transfusion when compared to vaginal delivery; there were more neonatal admissions in the vaginal delivery group as well as more birth trauma, neonatal seizures and death in this group; Apgar scores were higher in the CS group and finally, neonates born by CS were more commonly discharged at the same time as their mothers in the CS group.

Part II

When analyzing the registrar questionnaire it can be noted that although clinicians are performing an adequate number of breech vaginal deliveries, with an average of 10 deliveries per year, the skills training for clinicians is invaluable. Not all registrars learned skills from a senior clinician and skills training in skills labs are essential for initial and even continual training of these clinicians. It is suggested that these skills training programs be

made compulsory for all registrars and that a biyearly attendance and completing of such a course be mandatory for those wishing to work in the labour ward.

Conclusions:

Although not statistically significant, there was more morbidity and mortality associated with vaginal breech delivery.

Abstrak

Doel: Om die korttermyn neonatale en moederlike uitkomst van enkeling swangerskappe met stuitligging wat vaginaal of met elektiewe keisersnee verlos is by die Tygerberg Akademiese Hospitaal in Kaapstad, te bepaal.

Die werkstuk is 'n retrospektiewe gekontroleerde-gevalllestudie.

Metode:

Deel 1

'n Totaal van 120 pasiënte is gekies. 60 gevalle van vaginale stuitverlossings en 60 kontrole-gevalle van beplande elektiewe keisersnitte waar die indikasie stuitligging was.

Deel 2

Negentien kliniese assistente het die vraelys oor hul persoonlike ervaring van vaginale stuitverlossing by die Tygerberg Akademiese Hospitaal ingevul.

Resultate:

Deel 1

'n Ontleding van die resultate wys statisties betekenisvolle verskille in die moederouderdom van die twee groepe, met meer jong vroue wat met keisersnit geboorte gee. Graviditiet en pariteit was laer in die keisersnit-groep. Bloedverlies was hoër in die keisersnit-groep en in vergelyking met die vaginale verlossings met meer vroue wat bloedoortapping benodig. In die vaginale verlossingsgroep was meer neonatale toelatings nodig asook meer geboortetrauma, neonatale konvulsies en sterftes. Apgar-tellings was hoër in die keisersnitgroep en neonate wat met 'n keisersnitte gebore is, is meer dikwels saam met hul moeders ontslaan.

Deel II

Ontleding van die vraelys vir kliniese assistente wys dat hoewel klinici 'n genoegsame getal van gemiddeld 10 vaginale stuitverlossings per jaar uitvoer, vaardighedsopleiding vir klinici van onskatbare waarde sal wees.

Nie alle kliniese assistente leer vaardighede by senior klinici nie en opleiding in 'n vaardighedslaboratorium is noodsaaklik vir die aanvanklike en selfs voortdurende opleiding van dié kliniese assistente. Dit word voorgestel dat hierdie vaardigheidkursusse verpligtend

gemaak word vir alle kliniese assistente en bywoning en voltooiing van die kursus twee maal per jaar verpligtend moet wees vir diegene wat in 'n kraamsaal wil werk.

Gevolgtrekking:

Vaginale stuitverlossings, hoewel nie statisties betekenisvol nie, het met meer morbiditeit en sterftes gepaardgegaan.

Introduction

Term breech presentations occur in 3-4% of all pregnancies¹. For the last few decades the mode of delivery has been a controversial topic of debate when considering the weight of maternal versus neonatal morbidities and mortalities. Tygerberg Academic Hospital (TBH) still practises the delivery of vaginal breech infants after strict prerequisites have been fulfilled. In the developing country setting there will always be an unavoidable number of 'unbooked' women who present to delivery centres with undiagnosed breech presentations in established labour. The skill to perform such deliveries is therefore essential. The question remains: how safely are breech deliveries being performed at TBH?

Literature Review

The largest randomized clinical trial ever undertaken on term breech mode of delivery is the Term Breech Trial (TBT). This multicentre trial was published in 2000 and was designed to determine the safest mode of delivery for a term breech fetus. The most significant finding reported was that of increased short term neonatal morbidity in the trial of labour (TOL) group in countries with a low perinatal mortality rate (0.4% versus 5.1%). Furthermore the trial showed no difference in perinatal mortality, maternal mortality or serious morbidity. On the basis of these results the worldwide rate of planned caesarean sections (CS) at term increased, and as a result less vaginal term breech deliveries were conducted. Along with the decline of these vaginal deliveries the expertise to do these deliveries was potentially lost².

Later, the weaknesses of the TBT was identified, the major limitations of which included, inadequate case selection and intrapartum management; maternity units with markedly different skill levels grouped together, and short term morbidity used as a predictive marker for long term neurological impairment³.

One half of the sample was followed up 2 years later and no difference in the combined perinatal death and abnormal neurological outcome was found (3.1% in the planned CS group, and 2.8% in the TOL group)⁴. The only infant out of a group of 18 to have a serious neonatal morbidity at two years of age was not likely related to the delivery. The difference

in infant outcome proved beneficial in the TOL, reporting less “medical problems in the past several months” (15% vs. 21%; $P=0.02$). Maternal outcomes at 2 years were also similar⁵.

In 2006 Goffinet *et al.* published the PREMODA study in response to the TBT. This multi-centre descriptive study collected prospective data from 8105 women in 174 centres in France and Belgium⁶. This non-randomized trial allowed for the contemporary practice in careful selection of patients for vaginal breech delivery with an average varying between centres (47.8-89.0%). The objective of the study was to collect data within their obstetric practices, that is, countries where planned vaginal deliveries were still common. Overall, CS was planned in 69% and a TOL undertaken in 31% of which 71% delivered vaginally. The main outcome measure was a variable that combined fetal and neonatal mortality and severe neonatal morbidity. In contrast to the TBT, no difference was found between perinatal mortality (0.08% vs. 0.15%) or serious neonatal morbidity (1.6% vs. 1.45%) between a TOL and planned CS. No differences in maternal outcomes were observed.

In 2006, the Royal College of Obstetricians and Gynaecologists and the American College of Obstetrics and Gynaecology replaced their previously restrictive 2001 breech guidelines with new versions in favour of selected vaginal breech deliveries, concluding that “in places where planned vaginal delivery is a common practice and when strict criteria are met before and during labour, planned vaginal delivery of singleton fetuses in breech presentation at term remains a safe option that can be offered to women”⁷.

Factors which have been associated with breech presentation include: nulliparity; previous breech birth; uterine anomaly; contracted pelvis; placenta praevia; corneal placenta; decreased or increased amniotic fluid volume; extended foetal legs; multiple pregnancy; prematurity; short umbilical cord; decreased foetal activity; impaired fetal growth; fetal anomaly, fetal death and use of anticonvulsant drugs⁵. There is higher perinatal mortality and morbidity with breech than cephalic presentation, due principally to prematurity, congenital malformations and birth asphyxia or trauma⁸.

The maternal morbidity rate is increased twofold with CS delivery compared with vaginal delivery⁹. Principal sources are puerperal infection, haemorrhage, and thrombo-embolism, but not all morbidity is immediate, as long-term complications as well as the implications on the following pregnancies are noted¹⁰. Declerq and colleagues reported that re-hospitalization in the 30 days following CS delivery was more than three times as common as after vaginal delivery—75 versus 19 hospitalizations per 1000 deliveries¹¹.

The TBT selection criteria for vaginal breech delivery included²:

- Singleton live foetus in frank or complete breech at term (≥ 37 weeks' gestation);
- Exclusion if evidence of fetopelvic disproportion;
- Exclusion if foetuses were judged clinically as larger than 4000g;
- Exclusion if there was hyperextension of the fetal head;
- Exclusion if there was a fetal anomaly or condition that might cause a mechanical problem at delivery (such as hydrocephalus).

In comparison the TBH selection and exclusion criteria includes more conservative weight parameter with foetuses assessed as weighing more than 3500g qualifying for an elective CS. It is hoped that this parameter would further prevent any adverse maternal and neonatal outcomes during vaginal deliveries.

At Tygerberg women who have an uncomplicated singleton breech pregnancy at 36 weeks gestation are offered external cephalic version with exceptions of foetal compromise, ruptured membranes or oligohydramnios, vaginal bleeding or medical conditions (including HIV sero-positive mothers). Thereafter the selection criteria for vaginal deliveries of breech babies are:

- A maternal pelvis that has been evaluated as adequate (Imaging not included. The prerequisite only applies to women that have not previously had a normal term delivery.)
- Estimated fetal weight below 3.5kg and above 1,5kg;
- Frank or complete breech lie;
- Ultrasonographic exclusion of hyper-extension of the fetal head.

The latest *Green Top Guidelines* of factors regarded as unfavourable for vaginal breech birth are not much different.¹²

1. Other contraindications to vaginal birth (e.g. placenta praevia, compromised foetal condition)
2. Clinically inadequate pelvis
3. Footling or kneeling breech presentation
4. Large baby (usually defined as larger than 3800 g)
5. Growth-restricted baby (usually defined as smaller than 2000 g)
6. Hyper-extended fetal neck in labour (diagnosed with ultrasound or X-ray where ultrasound is not available)
7. Lack of presence of a clinician trained in vaginal breech delivery
8. Previous caesarean section.

Tygerberg also has guidelines regarding the intra-partum management of vaginal breech deliveries. A comparison between these guidelines and the TBT is shown in Table 1.

Numerous retrospective series comparing a TOL with planned CS have been published, some of which were large enough to demonstrate acceptable safety of breech birth in individual units.¹⁴⁻²⁰ But, in light of the retrospective data collection their conclusions cannot be generalized to differently specialized units. To date no such trial has been published on the safety of breech deliveries in Tygerberg Hospital.

Aim of the Study

To review the difference in short term neonatal and maternal outcomes among singleton infants with breech presentation delivered by vaginal versus elective caesarean section route both at term at Tygerberg Academic Hospital (TBH) in Cape Town. With these results it will be possible to assess the safety of deliveries of breech neonates in this unit and possibly in the light of this review our selection criteria. Furthermore to compare the rate of morbidity and mortality of vaginal breech deliveries in our unit with those internationally (Part I). In addition, to assess the subjective experience of clinicians at this hospital with regards to the delivery of singleton breech babies (Part II).

Methodology

Part I

In this case-controlled study singleton term breech deliveries (36-42 weeks) occurring at TBH were eligible for the study. Consecutive deliveries were collected retrospectively from 2007 up to and including December 2009 from the delivery labour registers in labour ward. 60 cases of vaginal deliveries were collected and 60 control cases of planned elective caesarean sections, where the indication for CS was breech presentation, were collected in the same manner. Exclusion criteria included: severe maternal disease i.e. stage 4 AIDS, pre-eclampsia, eclampsia; severe pregnancy complications that may affect outcome (i.e. grade 3 and 4 placenta praevia, eclampsia and abruption placentae) and severe fetal anomalies.

Maternal and neonatal charts were drawn from the records department of the hospital and data collected and entered onto a data sheet (See addendum A). Three extra parameters were observed, not included in the initial data sheet but later included: previous caesarean sections; maternal HIV status and CD4 count where applicable and; length of hospital stay in days of the mother following delivery. Data was then entered into a database for analysis.

The primary outcomes included: Perinatal or neonatal death (excluding gross anomalies) and serious neonatal morbidity (e.g. admission to high care or Neonatal ICU); and maternal death or serious maternal morbidity. The latter was classified as admission to intensive care, septicaemia, organ failure or the need for a blood transfusion.

Secondary outcomes as mentioned in Table 2.

1. Sample size and sampling method:

Sample sizes of 60 in group one and 60 in group two have a 83% power to detect a non-inferiority margin difference between the group proportions of 0.10 regarding neonatal morbidity. The reference group proportion is 0.05. The treatment group proportion is assumed to be 0.15 under the null hypothesis of inferiority. The power was computed for the case when the actual treatment group proportion is 0.05. The test statistic used is the one-sided T-test. The significance level of the test was 0.05.

Method of data analysis: For categorical data: chi-square test (or Fisher exact test with small numbers), for continuous data student T-tests were used and Mann-Whitney U test for non-parametric data.

Part II

Registrar sample size: Total number of 19.

The trial was approved by the local research ethics committee. (*Trial number: N10/06/199*)

Results

Part I

The mean maternal age in the study was 27.05 in the CS group and 29.9 in the vaginal group with ages ranging between 15 and 44 years (Table 3). The mean gravidity in the CS group was 3.1 (ranging from 1 to 7) with a median of 2. The mean gravidity in the vaginal delivery group was 2.25 (ranging from 1 to 10) and a median of 3. The mean parity in the CS group was 1.9 (ranging from 0 to 4) with a median of 1. The mean parity in the vaginal delivery group was 1.0 (ranging from 0 to 7) with a median of 2. Women in the vaginal delivery group were significantly older and of significantly higher gravidity and parity compared to women in the CS group (Table 3). In the CS group the gestation of booking of pregnancy averaged at 20.1 and 21.4 in the vaginal delivery group. Breech presentation was diagnosed at an average gestational age of 37.1 weeks in the CS group and at 37.6 weeks in the vaginal group. None of these gestational ages differed significantly between the groups. Of the 60 CS cases 18 cases underwent an attempted external cephalic version which was significantly more than the 5 in the vaginal delivery group that were attempted ($p = 0.005$). The mean gestational age at onset of labour in the CS group was 38.8 weeks and 38.3 in the vaginal delivery group ($p = 0.83$). All 60 CS were planned to deliver by CS where 5 of the vaginal deliveries were planned to deliver by CS, 48 were diagnosed as breech intra-partum and therefore not planned vaginal deliveries and 7 were planned as vaginal deliveries.

In the CS group, the mean blood loss during delivery was 350 ml with a median of 300ml and 2 (3.3%) patients required blood transfusion. In the vaginal delivery group the mean

blood loss during delivery was 201 ml, with a median of 150 ml, and none of the patients in this group required blood transfusion. There was a significant difference in blood loss between the groups ($p < 0.0001$; Table 4 and Figures 1 and 2).

Nine of the 60 (7.5%) CS patients had previously had a CS compared to 2 (1.67%) of the vaginal delivery group. The difference was not significant ($p = 0.06$). Both groups had 6 (5%) HIV-positive patients. Days stayed in hospital post delivery ranged from 1 to 11 with a mean of 3 days (26.5% of the group) in the CS group and within the vaginal group ranged from 1 to 6 days with a mean of 1 day (50% of the group). There was a significant difference in length of hospital stay between the groups ($p < 0.0001$; Table 5 and Figure 3).

Of the 60 vaginal deliveries the mean time of the first stage of labour, that is the time recorded from the active phase of labour to full dilatation was 5.64 (95% CI +/- 4.5 hours) hours (Table 6, Figures 4 and 5). The mean time of the second stage of labour, that is from full dilatation of the cervix to complete delivery of the neonate, was 0.36 hours (95% CI +/- 0.26 hours; Table 5 and Figures 4 and 5). Only in three of the cases was oxytocin used to augment labour. Health professionals involved in the performance of CS and vaginal deliveries are shown in Table 7. Of the 60 patients 28 (46%) had perineal injuries, 16 (26%) of which were episiotomies, 10 (16%) had 1st degree perineal tears and only 2 (3%) had 2nd degree perineal tears. No 3rd or 4th degree perineal tears occurred (Figure 6).

Spinal anaesthesia was the predominant mode of anaesthetic (95% of cases) for the CS procedures with 2 (3.33%) of the 60 requiring a general anaesthetic. No intra-operative complications were noted. However 9 (15%) of the patients experienced post operative complications. Of these 1 patient had an incompletely removed placenta requiring further surgical evacuation; 2 patients had infective lung complications requiring antibiotics; 1 patient had a wound infection requiring antibiotics and 5 experienced a post-operative fever of more than 38°C. One (1.67%) patient in the vaginal delivery group received epidural anaesthetic. Furthermore, 1 (1.67%) patient in the vaginal delivery group had a retained placenta requiring manual removal in theatre.

In the CS group 33 neonates were female and 27 male, and 29 female and 31 male in the vaginal group. The mean 5 minute Apgar score for the CS group was 9 (51,0%) with the lowest count being 1 and a median of 9. In the vaginal group the mean 5 minute Apgar score was 9 (36.6%) with the lowest count being 0 (2 of 60), the highest 9 and a median of 8. There was a significant difference in 5 minute Apgars between the groups ($p=0.001$). The mean 10 minute Apgar score in the CS group was 9.5 (50,0%), with the lowest count 8 and a median of 9.5. In the vaginal delivery group the mean 10 minute Apgar score was 8.1 (33,0%) with the lowest being 0 (1 of 60), the highest 9 and a median of 9 (Figures 7 and 8). There was a significant difference in 10 minute Apgars between the groups ($p = 0.003$). The mean birth weight in the CS group was 3180g that ranged from 1980g to 4520g. The mean birth weight in the vaginal delivery group was 2960g, the minimum was 1900g to 4100g (Table 8). There was no significant difference in birth weight between the two groups ($p = 0.043$). Significantly less ($p = 0.00006$) of the 60 CS deliveries was admitted to neonatal high care units (1 neonate), compared to 18 (30%) in the vaginal delivery group. Birth trauma was observed in 1 of the CS deliveries (superficial laceration to skin during surgery, requiring sutures) and in 3 in the vaginal deliveries (5%). 1 of these 3 was trauma to the foot requiring follow up, 1 vulva laceration, not further described, 1 was non-specific bruising (Table 9). Birth trauma did not differ significantly between the groups ($p = 0.62$). A composite risk score combining trauma, seizures, perinatal death and neonatal ICU admissions found 5 patients in the vaginal delivery group and 1 in the CS group. This composite analysis did not show a statistically significant difference ($p = 0.2$).

Only 1 of the 120 neonates was observed to have seizures and this in the vaginal delivery group. A further diagnosis of hypoxic ischaemic encephalopathy was made with resultant spastic cerebral palsy and an abnormal head sonar. The neonate was born to a 36 year old gravida three para two female that booked late at 36 weeks gestation. Breech was diagnosed at time of labour at 41 weeks gestation. The first stage of labour lasted 3 hours and ten minutes and the second stage of labour lasted ten minutes. The delivery was performed by a registrar who documented difficulty delivering the after-coming neonatal head. The male infant weighed 3170 grams and had Apgars of one and three at five and ten minutes respectively. The mother had no perineal injuries and blood loss during delivery

was recorded as 200 millilitres. The mother was discharged within 24 hours of delivery but the infant was admitted to the neonatal ward with symptoms of birth asphyxia.

Furthermore the 1 perinatal death also occurred in the vaginal delivery group. In this case a 20 year old primigravida patient had booked at 24 weeks gestation and breech was diagnosed at 37 weeks on admission in labour. The patient was received from a peripheral clinic and referred with the after-coming foetal head lodged in the pelvis. The first stage of labour was documented to last 3 hours and the second stage lasted 2 hours and 15 minutes. No augmentation or forceps were used and it appears that there was no foetal pulse on admission to the unit. The male neonate weighed 2600g and had Apgar scores of zero. The mother sustained first degree perineal tears. The patient was discharge within 24 hours of admission. Finally, all neonates delivered via CS were discharged with the mother and 44 (73%) of neonates delivered vaginally were discharged with the mother.

Part II

Results of the questionnaire

1. Which criteria do you think should be met before proceeding with a vaginal breech delivery?

In light of the Tygerberg Hospital criteria for breech deliveries all clinicians mentioned the importance of foetal weight and all but 2 registrars mentioned the importance of the type of breech that classifies for vaginal delivery, that is complete or frank breech only. 12 (63.2%) of the 19 failed to mention the attitude of the foetal head and 11 (57.9%) of the 19 omitted the importance of an adequate maternal pelvis for delivery.

2. Do you feel comfortable delivering a singleton breech vaginally? Yes / No

3 of the 19 registrars stated that they were not comfortable to do vaginal breech deliveries independently.

List your levels of anxiety when doing a breech delivery:

0 = relaxed and 5 = extremely anxious

The median level of anxiety out of 5 was 2, with 9 (47.4%) of registrars in this category. Seven (36.8%) of registrars felt more anxious with levels of 3 and 3 (15.8%) registrars recorded levels of 1. No clinicians recorded any levels above 3.

3. Do you perform breech vaginal deliveries?

All 19 clinicians admitted to doing breech deliveries.

a. How did you learn your expertise?

Expertise was mostly obtained from a senior clinician with 17 (78.9%) of the 19, 8 (36.8%) from a book and 2 (10.5%) from clinical training programs.

b. On average how many do you perform per year?

17 (89.5%) registrars reported performing less than 10 breech deliveries per year and 2 (10.5%) reported up to 20 deliveries per year.

c. Can you think of a case(s) managed personally where there was neonatal mortality related to the delivery? If, yes, how many? And please elaborate.

Two registrars each reported one case where neonatal mortality occurred.

d. Can you think of a case(s) managed personally where there was neonatal morbidity related to the delivery? If, yes, how many? Please name the complication(s) and elaborate.

Two registrars recalled cases where neonatal morbidity occurred. In one case the neonate experienced respiratory distress after delivery and in the other the neonate experienced a humerus fracture.

e. Can you think of a case(s) managed personally where there was maternal mortality related to the delivery? If, yes, how many and please elaborate.

No cases of maternal mortality were noted.

f. Can you think of a case(s) managed personally where there was maternal morbidity related to the delivery? If, yes, how many and please name the complication(s) and elaborate.

Two cases of maternal morbidity were noted but were clinically unrelated to the breech delivery.

4. Which manoeuvre(s) do you use during an assisted breech delivery in the following circumstances?

- Legs if frank breech

13 (68.4%) registrars would perform Pinard's manoeuvres and the remaining would remain passive at this stage of the delivery.

- Arms if flexed over chest

6 (31.5%) registrars would perform Loveset manoeuvre where the remaining would sweep the arms in front of the chest without rotation.

- After coming foetal head

All the registrars would apply the Mauriceau-Smellie-Veit method.

5. Do you think clinicians are properly trained at Tygerberg Hospital to perform vaginal breech delivery?

9 (47.4%) registrars stated that clinicians are properly trained at Tygerberg Hospital, 9 (47.4%) were dissatisfied with the training and one registrar failed to comment. Of those that answered the question in the negative the majority expressed a lack of senior supervision in the labour ward particularly after hours.

6. Do you think the current approach to the delivery of breech-lying neonates is appropriate?

15 (84.2%) registrars thought that the current approach to the delivery of breech-lying neonates was appropriate. Two failed to comment. The remaining 2 (10.5%) were dissatisfied with the current approach: one (5.2%) of which stated a personal preference for caesarean deliveries in breech cases and one (5.2%) attributed their decision to the lack of training as clinicians to perform these deliveries.

Discussion

The TBT divided maternal ages into years equal to and above 30 (32.6% in the planned CS group vs 31.8% in the planned vaginal delivery group) and below 30 (67.4% vs 68.2%).² The index study observed 33.3% of women in the CS group and 58.3% in the vaginal delivery group to be older than 30 years. There were 66.6% in the CS group and 41.6% in the vaginal

group below the age of 30. In the index group the age distribution for the CS group was similar to that in the TBT but in the vaginal delivery group the index study showed a higher percentage of women above the age of 30 when compared to the TBT. In the PREMODA study both the planned vaginal delivery group and the planned CS group had the highest percentage of women between the ages of 22 and 34 years (77.9% and 77.8% respectively), with 15.5% and 17.0% respectively being over the age of 35 years and only 6.6% and 5.2% respectively being under the age of 21 years.⁶ The index study did show a statistical significance in the difference in ages between the two modes of delivery ($p = 0.009$) and mean maternal ages of 27.0 in the CS group and 29.9 in the vaginal group.

Unlike the TBT where parity did not differ (0 in 52.6% of planned CS and 52.3% in the planned vaginal group; 1 to 4 in 41.7% of planned CS and 41.7% in planned vaginal group; more than 4 in 5.8% of planned CS and 6.1% in planned vaginal group), a statistically significant difference was shown between cases and controls in the index study with lower parity in the vaginal delivery groups ($p = 0.003$). The PREMODA study also had a statistically significant difference in parity with 47.2% in the planned vaginal delivery group and 58.7% in the planned CS group being nulliparous, 30.0% and 26.8% respectively being primiparous and 22.8% and 14.5% respectively being more than para one ($p = <0.001$). There was also a statistically significant lower gravidity in the vaginal delivery group in the index study ($p = 0.003$) although this parameter was not examined in the TBT or the PREMODA study.

The index study showed no statistically significant difference in the gestation at booking ($p = 0.782$) or the gestation at diagnosis of breech presentation ($p = 0.148$) nor was a difference in gestation at onset of labour noted between the two groups ($p = 0.083$). These parameters were not observed in previous studies.

There were similar numbers of patients undergoing an ECV in both groups in the TBT (21.9% in the planned CS group vs. 21.1% in the planned vaginal birth group). A statistically significant difference was found in the number of versions in the index study, as 15.0% occurred in the CS group and only 4.17% occurred in the vaginal delivery group ($p = 0.005$). The PREMODA study did not report on ECVs.

The TBT classified prolonged first stage of labour as more than 18 hours and observed 2.3% occurrence in the planned CS group and 0.2% in the planned vaginal birth group. The PREMODA study divided the first stage of labour into duration and observed 66.2% of the group lasting less than 4 hours, 13.6% of the group lasting between 4 and 6 hours and 1.4% of the group lasting more than 7 hours. There were also 18.8% of patients in this group that had an unspecified duration of time of first stage of labour. In comparison to these, only 1 of the 60 (1.7%) of patients in the index study had a prolonged first stage of labour as defined by the TBT. 23(38.3%) of patients in the index study were documented to have a first stage of labour lasting less than 4 hours, 17 (11.6%) had a first stage lasting between 4 and 6 hours, 17 (11.6%) lasted longer than 7 hours and 3 (5.0%) could be classified as unspecified. A direct comparison of the index study with the TBT and PREMODA study is not possible. However a much larger proportion of women in the PREMODA study had an active phase of the first stage of labour shorter than 4 hours compared to the index study (66.2% vs 38.3%). A concern is that in the index study 17 (11.6%) of patients had an active phase longer than 7 hours. Their progress of labour according to cervical dilatation was slower than suggested by the guideline ($\geq 1\text{cm/hr}$).

The TBT divided the second stage of labour into two groups: firstly, a duration of more than 2 hours with no pushing (1.1% in the planned CS group and 0.7% in the planned vaginal birth group) and secondly a duration of more than 1.5 hours with pushing (3.4% and 2.7% respectively). The PREMODA study divided the second stage of labour into the passive and active phases and these phases were further subdivided into durations of less than 30 minutes, between 30 and 60 minutes and more than 60 minutes. The majority of cases (63.9%) had a passive phase of the second stage of labour lasting less than 30 minutes and the same was true for the active phase of labour with the majority of cases (94.0%) lasting less than 30 minutes. The mean time in hours in the index study for the second stage of labour as a whole was 36.42 minutes and up to 75% of the group had a second stage of labour occurring within 50 minutes.

The duration of the second stage of labour in the index study does correspond with the PREMODA study. The long second stage (2hrs10min, Figure 5) was due to transfer from a Midwife Obstetric Unit (MOU) to hospital. The case with severe neonatal morbidity had a shorter second stage (10min).

In comparison to the 74.1% of patients in the PREMODA study that were augmented with oxytocin during labour the index study only observed 3 (5.0%) of the 60 patients that received augmentation. The number of patients in the index study that were augmented was also significantly lower than those augmented in the TBT (44.4% of all vaginal deliveries). The TBT did not specify the difference in use of oxytocin or prostaglandins for augmentation. However, a similar percentage of forceps deliveries were conducted in the PREMODA study (3.2%) and the index study (3.3%) for entrapment of the after-coming head. Although the TBT did not look at the use of forceps specifically, they did describe difficulty with delivery of the fetal head, arms, shoulders or body observed in 4.6% of planned vaginal deliveries. This was statistically significantly higher than the planned CS group of 2.1% ($p = 0.002$).

It is interesting to note that as many as 46.3% of patients in the TBT received epidural anaesthetic in the planned vaginal delivery group of the TBT and only 1 (1.7%) patient of the 60 in the index study was noted. However, less general anaesthetic (3.3%) was noted in the index study during CS than in the TBT (28.2%). Epidural anaesthetic during the first stage of labour at TBH is available to a limited extent and normally confined to women with poor progress in the first stage of labour that rules out breech deliveries. Epidural anaesthetics will also be available for specific indications dictated by maternal conditions like rheumatic heart valve lesions.

Where the TBT observed only postpartum bleeding and found no statistically significant difference between the two groups ($p = 0.68$), the index study observed blood loss during labour and showed greater loss during CS than at vaginal delivery ($p < 0.0001$). Furthermore, 2 (1.7%) patients in the CS group required blood transfusion in comparison to none in the vaginal delivery group, but no statistical significant difference was shown ($p = 0.496$). With

large numbers the difference will most likely be significant. The objectives of the PREMODA study did not include maternal morbidity.

Perineal injuries were observed in 46.7% of the vaginal delivery group in the index study, a larger percentage when compared to only 0.1% in the TBT. At closer examination, however, the majority of these perineal injuries were episiotomies (26.0%). Only 3.0% of patients had grade 2 perineal tears, the remainder having first degree tears (16.0%). No major injuries were noted and no tears exceeding grade 2. Although perineal tears do not factor into CS deliveries the surgical insult to the abdominal wall and uterus during such a procedure should not be overlooked.

The index study observed more post-delivery complications classified under maternal morbidity in the CS group (15.0%) when compared to the vaginal delivery group (1.7%). The TBT observed a post delivery wound infection rate of 1.4% of the planned CS group, the index trial observed a similar proportion in the same group of 1.7%. An insignificantly lower portion of patients in the TBT were observed to have wound infection in the planned vaginal delivery group (0.9%; $p = 0.32$) and none were noted in the vaginal delivery group of the index study. A post partum fever exceeding 38.0°C was observed in 2.8% of patients in the planned CS group in the TBT and in 8.3% in the index study. A slightly lower number were observed in the planned vaginal delivery group of the TBT (1.3%; $p = 0.71$) but none in the vaginal delivery group of the index study. The index study also observed maternal morbidity in the form of lung complications and observed 3.4% of patients in the CS group as opposed to none of the patients in the vaginal delivery group.

Unlike the TBT where one maternal mortality occurred in the planned vaginal delivery group only, no maternal mortalities were noted in the index study. The small number of the index study rules out any meaningful comparison.

Patients at TBH delivering by vaginal route had a statistically significant shorter hospital stay post delivery than those undergoing a CS ($p < 0.0001$) and similar results were noted in the TBT with the planned vaginal delivery group being discharged home on average after

2.8 days as opposed to the planned CS group who were hospital bound for an average of 4.0 days ($p = <0.001$). This has implications for under-resourced and over-burdened obstetric services. The cost of CS delivery should also be factored into a cost analysis. A cost analysis falls beyond the ambit of the index study.

Perinatal and neonatal mortality was observed in 1.9% of planned vaginal deliveries and 0.6% of planned CS deliveries in areas of high national perinatal mortality rates in the TBT ($p = 0.01$). The PREMODA study's sample included deaths secondary to lethal congenital conditions, an exclusion criteria of the index study, but after controlling for risk factors, the risk of fetal or neonatal mortality or serious morbidity was not significantly different among the planned vaginal and CS groups (adjusted OR = 1.40 95%CI [0.89-2.23]). Similarly the index study failed to show a statistically significant difference in neonatal mortality rates between the two groups ($p = 1.000$). The one case reported had a prolonged second stage due to being transferred from a MOU to hospital and arrived with the fetal head undelivered. This case highlights the importance of skills training of midwives at MOUs, also in breech deliveries.

There was a reduction in risk for neonatal morbidity from planned CS compared with planned vaginal birth and was shown to be much greater in countries with a low perinatal mortality rate (0.4% vs. 5.7%; $p <0.0001$) when compared to countries with a high perinatal mortality rate (2.9% vs. 4.4%; $p = 0.13$) in the TBT. Convulsions within the first 24 hours of life were noted in 0.1% of planned vaginal deliveries and 0.7% of planned CS deliveries ($p = 0.03$). Also similar was the rate of admission to neonatal ICU between the delivery groups (1.5% vs. 3.0%; $p = 0.02$). The PREMODA study observed 2.2% of neonates in the planned vaginal delivery group admitted to neonatal ICU when compared to 1.6% of neonates in the planned CS group. Furthermore the rate of convulsions was 0.2% and 0.1% for these groups respectively.

Similarly, a non-significant difference was observed in major morbidity of neonates in the index study, that of hypoxic ischaemic encephalopathy with permanent cerebral damage and convulsions, between the two groups of the index study with one case in the vaginal

delivery group vs none in the CS group ($p = 0.496$). Although the mentioned case was an intra-partum diagnosed breech, the first and second stages were short and uncomplicated. The question could be asked as to whether an antecedent antenatal event could have caused the resulting poor outcome. A statistically significant difference was shown in admission of neonates to high care post delivery between the two modes of delivery with 30.5% of neonates in the vaginal delivery group and only 1.7% in the CS group ($p < 0.001$). The observed difference can be attributed to the fact that all breech vaginal deliveries are routinely admitted to neonatal wards immediately following delivery for observation regardless of their condition at birth. On closer assessment, 26.7% of these neonates were admitted to general paediatric wards for observations only, with only 1 (1.7%) admission to the intensive care unit and 1 (1.7%) admitted to a special care unit.

An insignificant difference in the rate of birth trauma was observed in neonates of the TBT (0.6% in the planned CS group and 1.4% in the planned vaginal delivery group; $p = 0.05$) and the PREMODA study (0.5% vs. 1.8% respectively). The index study's incidence was slightly higher for both groups (1.7% vs. 3.7%) although there was no statistically significant difference between the groups ($p = 0.21$).

The TBT observed Apgars at 5 minutes and found a statistically significant higher number of neonates in the planned vaginal delivery group with counts less than 7 out of 10 (3.0% of neonates in the planned vaginal delivery group vs. 0.8% in the planned CS group; $p = 0.001$) but no difference between the groups for counts less than 4 out of 10 at five minutes (0.9% vs. 0.1%, $p = 0.01$). The PREMODA study observed 1.5% of neonates in the planned vaginal delivery group and 0.5% in the CS group to have Apgar scores less than 7 at five minutes, and a significantly higher percent of neonates in the planned vaginal delivery group (0.7%) with Apgars less than 4 than in the planned CS group (0.02%). In contrast, a larger difference was noted in Apgar scores between the two groups of the index study. 46.7% of neonates in the vaginal delivery group were observed to have Apgars less than 7 at five minutes and 16.7% of the group had Apgars less than 4 within this time. In comparison, only 6.7% of neonates in the CS group had Apgars less than 7 at five minutes and 3.3% in this group had Apgars less than 4 ($p = 0.001$). Apgar scores at 10 minutes were not observed in previous

studies but a statistically significant difference was also noted between the two groups of the index study with a $p = 0.002$.

The TBT observed birth weight in groups more than 4000g and less than 2500g. There was a significantly higher number of neonates weighing more than 4000g in the planned vaginal delivery when compared to the planned CS delivery group (5.8% vs. 3.1%; $p = 0.002$). However an insignificant difference was observed in neonates weighing less than 2500g (4.8% vs. 4.6%; $p = 0.48$). More descriptive were the results of neonatal weights in the PREMODA study with groups divided into weight groups: < 2500g; ≥ 2500 and < 3000g; ≥ 3000 g and <3500g; ≥ 3500 g and < 4000g; ≥ 4000 g. A larger number of neonates were observed to weigh more than 4000g in the planned CS group (4.2% vs. 2.5% in planned vaginal delivery group) and a comparable number were observed in both groups weighing less than 2500g (5.3% vs. 6.1%)(Table 10). In the index study 10% of neonates in the CS group weighed more than 4000g and 1.7% of those in the vaginal delivery group. 10% of the CS group weighed less than 2500g and 13.3% in the vaginal delivery group. In comparison to previous trials the index study had larger numbers of neonates weighing less than 2500g in both vaginal and CS deliveries as well as larger numbers of neonates weighing more than 4000g in the CS group but less numbers in the vaginal delivery group. In the light of this there is no clear correlation between adverse neonatal outcomes and birth weights in the vaginal delivery of breech presentations.

Although mothers delivering vaginally were observed to be discharge from hospital sooner than those who underwent a CS, these women were less likely to take their newborns home with them on the same day. 27% of these infants were not discharged with their mothers but this can most probably be explained by the fact that the majority of mothers in this group were discharged within 24 hours of delivery.

There is, however, a separate group of patients that this study failed to examine: the outcomes of delivery by caesarean section following a failed trial of labour. One can only speculate from previous studies that the outcomes would be inferior to that of the elective Caesar group and how these cases would compare to the vaginal delivery group is

uncertain.^{21,22} This could be a topic for further research in the department. The safety of planned vaginal breech deliveries could be assessed in a prospective study where outcomes could be compared to those of planned CS for breech presentation.

As with most retrospective studies, the index study includes certain shortcomings associated with the nature of such a study. One of these would include certain data that is not available in case files e.g. documentation of blood loss.

The importance of early booking of all pregnancy cannot be over emphasized. Careful clinical assessment of fetal lie and presentation should be routine during prenatal examination, from 34 weeks onwards. Early detection and a policy of considering all non-cephalic singletons for ECV near term can see the reduction of both neonatal and maternal morbidity.

Breech births and caesarean deliveries can be significantly reduced by use of external cephalic version (ECV).^{23,24} A systematic review showed that ECV at term was associated with a significant reduction in non-cephalic births (RR 0.42, 95% CI 0.35-0.50) and caesarean delivery (relative risk 0.52, 95% CI 0.39-0.71) The Royal College of Obstetricians and Gynaecologists recommends that a skilled service for ECV should be available and offered to women with breech presentation at term.¹² Likewise, the American College of Obstetricians and Gynecologists (ACOG) recommends that all women near term with breech presentation should be offered an attempt at version.²⁵ At Tygerberg Academic Hospital (TAH) has a policy for external cephalic version of breech singletons from as early as 36 weeks gestation. Included in this group are mothers with a previous caesarean section without other contra-indications for ECV. HIV sero-positive patients are not offered this procedure as studies are sparse regarding the rate of HIV transmission with ECV.²⁶

The labour register of TBH showed a total of 7142 births in the year of 2007 of which 158 were breech deliveries, 7302 in 2008 of which 177 were breech and 6103 in 2009 of which 206 deliveries were breech deliveries. It is clear that breech presentations at term are a very real and constantly increasing reality in our clinical setting and that appropriate

management and decision making of the route of delivery is an indispensable skill for obstetricians and nurses alike.

When analyzing the registrar questionnaire it can be noted that although clinicians are performing an adequate number of breech vaginal deliveries, with an average of 10 deliveries per year, the skills training for clinicians is invaluable. Not all registrars learned skills from a senior clinician and skills training in skills labs are essential for initial and even continual training of these clinicians. It is suggested that these skills training programs be made compulsory for all registrars and that a biyearly attendance and completing of such a course be mandatory for those wishing to work in the labour ward.

In a developing country setting vaginal breech deliveries are an unavoidable reality in the labour ward. A large number of breech presentations are diagnosed at the time of onset of labour. This study was able to draw a comparison between the outcomes of a planned elective CS for breech and a vaginal delivery at term. It became clear when examining the data that not all patients in the vaginal delivery group underwent the careful selection process as stipulated in the TBH guidelines. It stands to question whether the outcomes of these can fairly be compared to the control group or whether conclusions should be drawn for management of planned vaginal deliveries based on these. Although not statistically significant, there was more morbidity and mortality associated with vaginal breech delivery.

Conclusion and Recommendations

In conclusion this study found statistically significant differences in maternal ages between the two groups, with younger women delivering by CS; gravidity and parity was lower in the CS group; blood loss was observed to be higher in the CS group with more women requiring a blood transfusion when compared to vaginal delivery; there were more neonatal admissions in the vaginal delivery group as well as more birth trauma, seizures and neonatal death in this group; Apgar scores were higher in the CS group and finally, neonates born by CS were more commonly discharged at the same time as their mothers in the CS group.

Inevitable vaginal breech deliveries cannot be avoided in such a setting where the incidence of unbooked patients, with poor if any delivery plans made remains less than ideal. Vaginal breech deliveries under these conditions remain less than ideal and outcomes can be dire as seen in the neonatal death observed in this study. Although not statistically significant, there was more morbidity and mortality associated with vaginal breech delivery.

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Table 1

Comparison of intra-partum management of vaginal breech deliveries

	TBT	TBH
Induction	Yes	No
Amniotomy	Yes	No
Augmentation	Yes	No
Progress	≥ 0.5 cm/hr	≥ 1cm/hr
Descent (on full dilatation)	2 hours	Progressive descent
2 nd stage	≤ 1 hr	≤ 30 min

Table 2

Secondary Outcomes

Short-term perinatal/neonatal outcomes

Serious neonatal morbidity (e.g. seizures, neonatal encephalopathy, birth trauma);
 Apgar score less than seven at 5 minutes;
 Neonatal intensive care unit admission;

Short-term maternal outcomes

Regional analgesia;
 General anaesthesia;
 Instrumental vaginal delivery;
 Postpartum haemorrhage (blood loss greater than 500 mL during a vaginal delivery or greater than 1,000 mL with a CS);
 Need for blood transfusion;
 Wound infection;
 Perineal injuries
 (Only outcomes for which data were available will be included in the analysis tables. Numbers with inadequate information will also be documented.)

Table 3

Comparison of Mode of Delivery - Continuous Variables

Variables	Mode of Delivery	Minimum	Maximum	Mean	Median	Standard Deviation	P-value
Age	CS*	15	42	27.05		5.90	0.009
	VD*	17	44	29.98		6.28	
Gravity	CS	1	7	1.88	2	1.42	0.004 ^x
	VD	1	10	3.11	3	1.80	
Parity	CS	0	4	1.03	1	1.14	0.002 ^x
	VD	0	7	1.93	2	1.62	
Gestation at Booking (weeks)	CS	6	40	20.60		7.77	0.750
	VD	1	38	21.48		9.13	
Breech Diagnosed (weeks)	CS	34	42	37.12		2.23	0.146
	VD	32	42	37.68		2.10	
Gestation at Labour (weeks)	CS	34	43	38.88		1.62	0.083
	VD	34	42	38.37		1.68	

*CS (Caesarean Sections) VD (Vaginal Deliveries)

^x P-values determined by Mann-Whitney U test

Table 4

Blood loss during delivery

	N	Mean	95% CI	95% CI	Median	Minimum	Maximum	Std.Dev.	P - value
CS	25	450.00	360.23	539.76	400.00	100	800	217.46	<0.0001
VD	82	268.41	228.26	308.56	200.00	0	800	182.72	

Table 5

Days stayed in hospital post delivery

	0	1	2	3	4	5	6	11	Row - Totals
Caesar	1*	1	4	31	18	3	1	1	60
Total %	0.84%	0.84%	3.36%	26.05%	15.13%	2.52%	0.84%	0.84%	50.42%
Vaginal	12	30	10	4	2	0	1	0	59
Total %	10.08%	25.21%	8.40%	3.36%	1.68%	0.00%	0.84%	0.00%	49.58%
Totals	13	31	14	35	20	3	2	1	119
Total %	10.92%	26.05%	11.76%	29.41%	16.81%	2.52%	1.68%	0.84%	100.00%

*Patient requested discharge on own responsibility

Table 6

Duration of 1st and 2nd stages of vaginal delivery group

Hours	Valid N	Mean	95% CI	95% CI	Median	Minimum	Maximum	Std.Dev.
MoD: Dur - 1st Stage	57	5.64	4.59	6.69	5.00	1.41	24.00	3.955920
MoD: Dur - 2nd Stage	60	0.36	0.26	0.46	0.20	0.01	2.25	0.387976

MoD (Mode of Delivery)

Table 7

Health professionals involved in performing CS and conducting vaginal deliveries

	Registrar	Consultant	Medical Officer	Nurse	Intern
CS	21 (17.5%)	1 (1.7%)	35 (29.2%)	0 (0.0%)	0 (0.0%)
VD	34 (38.3%)	7 (5.8%)	7 (5.8%)	11 (9.2%)	1 (1.7%)

Table 8

Birth Weight

	N	Mean	Std.Dev.	Median	Minimum	Maximum
CS	60	3180.27	591.84	3100.00	1980.00	4520.00
VD	60	2960.02	500.19	2865.00	1900.00	4100.00

Table 9

Birth Trauma

	No	Yes	N
Caesar	59	1	60
Row %	98.33%	1.67%	
Vaginal	57	3	60
Row %	95.00%	5%	
Fisher's exact two-tailed test			p=.20683

Table 10

Comparison of birth weight distribution

MoD	Study group	< 2500g	≥ 2500 – 3000g	≥ 3000g – 3500g	≥ 3500g – 4000g	≥ 4000g
VD	PREMODA	6.1%	30.1%	43.7%	17.6%	2.5%
	Index	13.3%	26.0%	23.2%	18.3%	1.7%
CS	PREMODA	5.3%	28.8%	42.1%	19.6%	4.2%
	Index	10.0%	22.0%	23.3%	18.3%	10.0%

Figure 1

Blood loss in the CS group

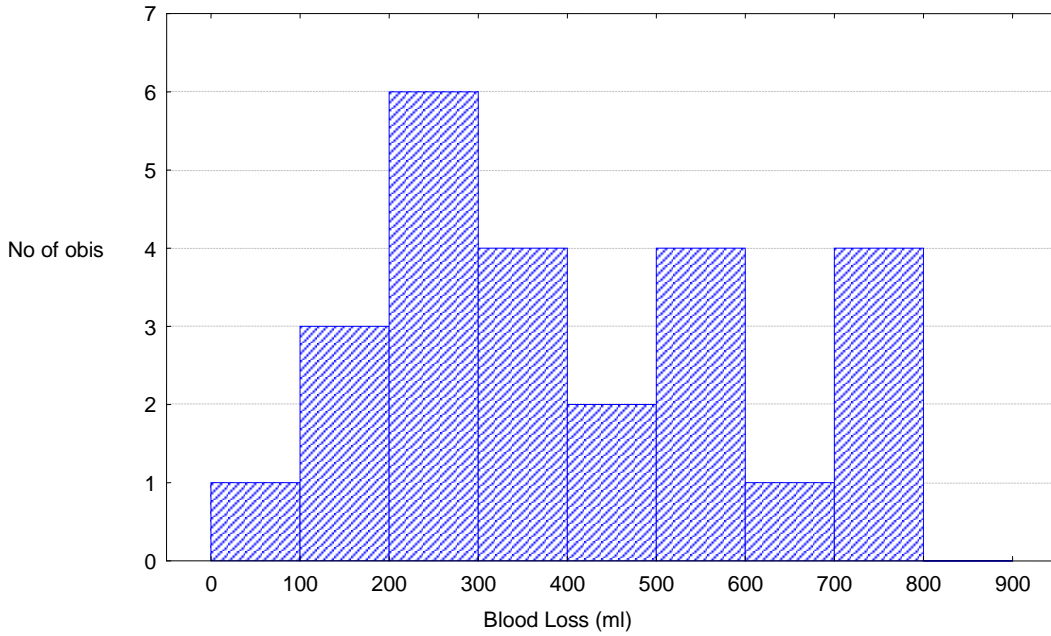


Figure 2

Blood loss in the vaginal delivery group

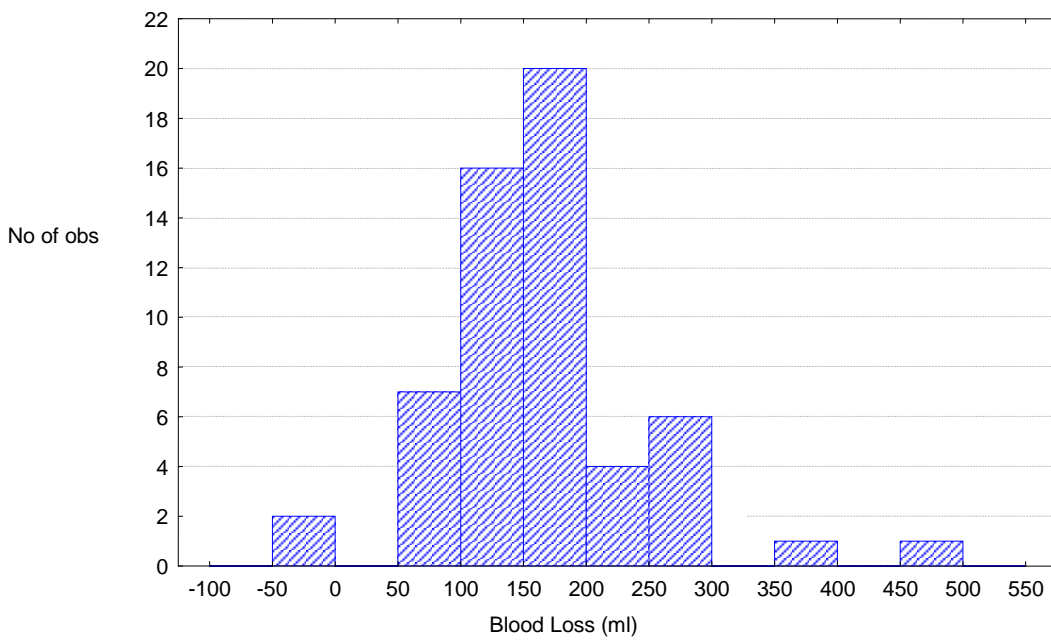


Figure 3

Days stayed in hospital post delivery

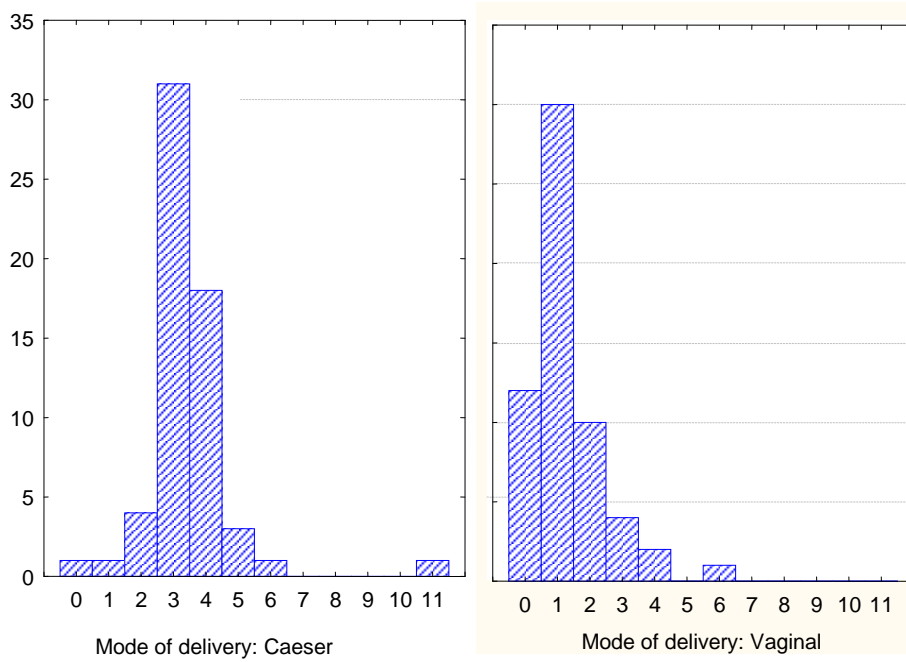


Figure 4

Duration of 1st stage of labour – vaginal delivery group

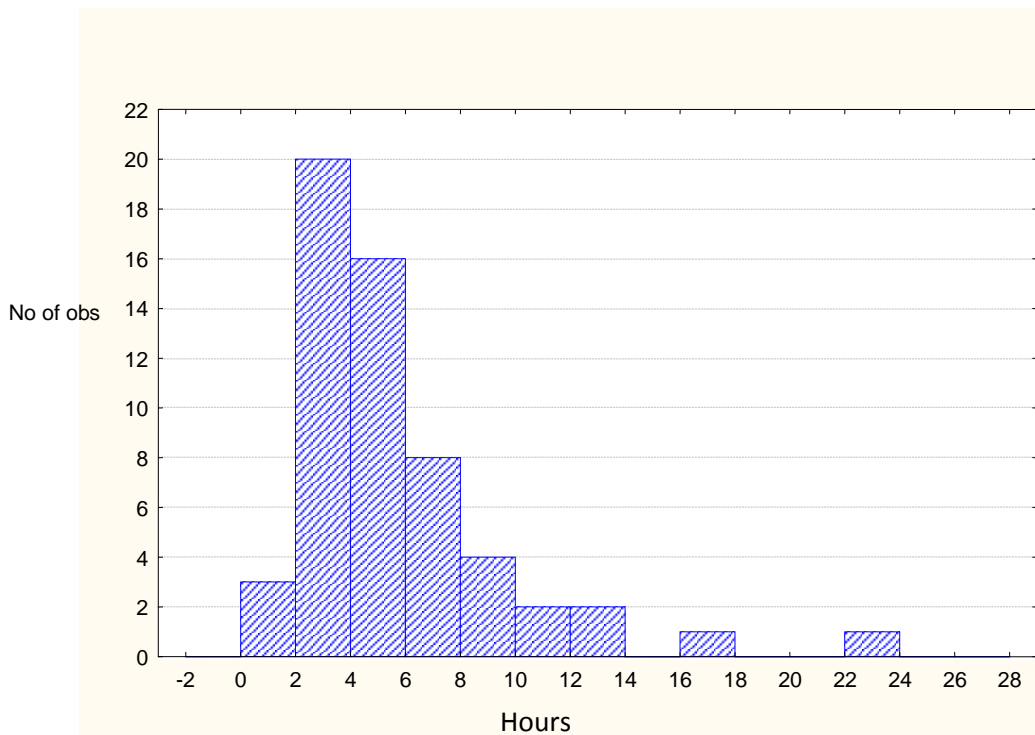


Figure 5

Duration of the 2nd stage of labour – vaginal delivery group

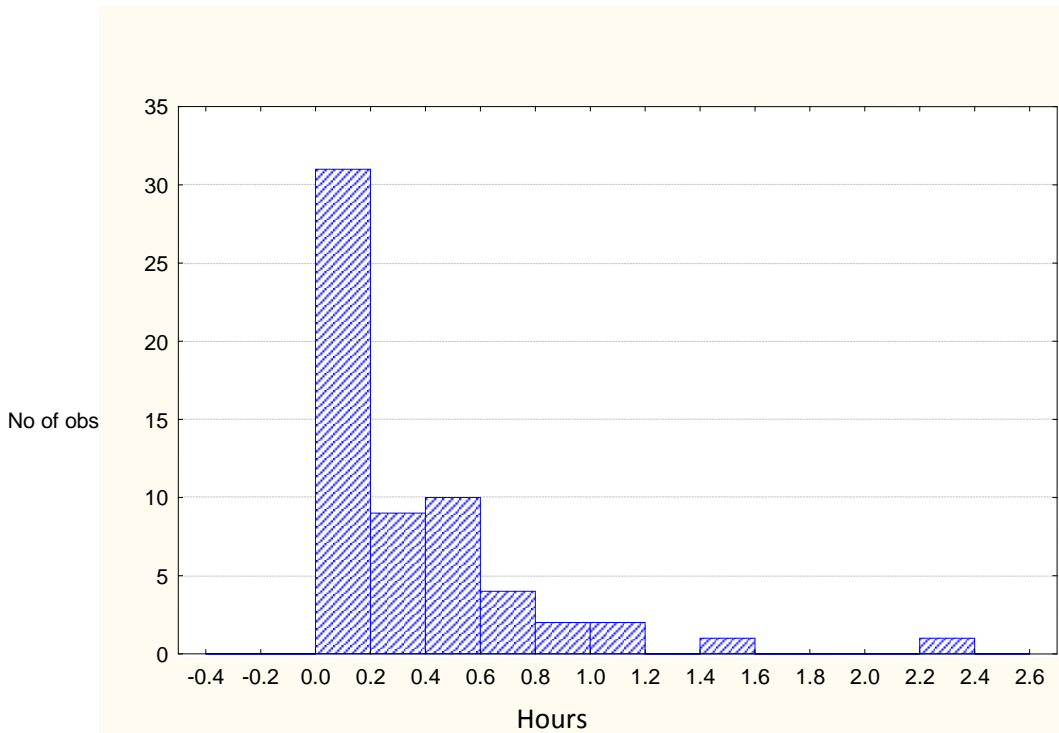


Figure 6

Perineal injuries in the vaginal delivery group

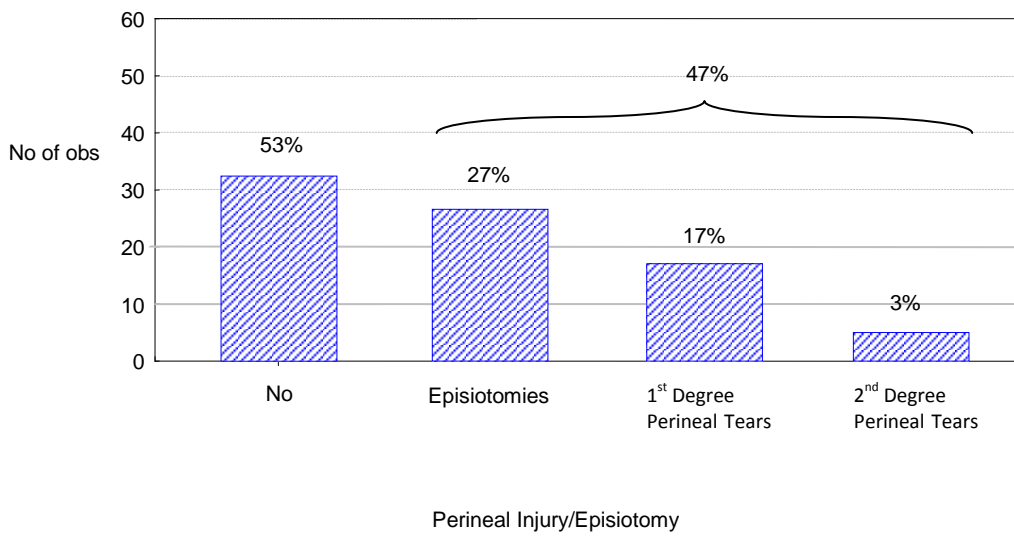


Figure 7

Five minute Apgars scores

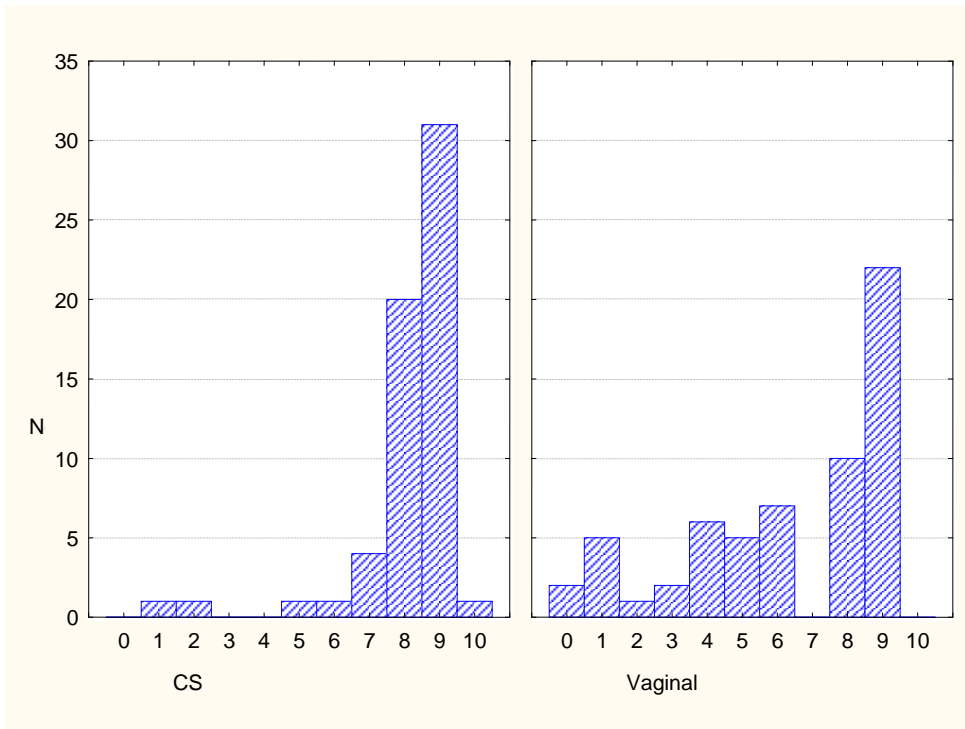
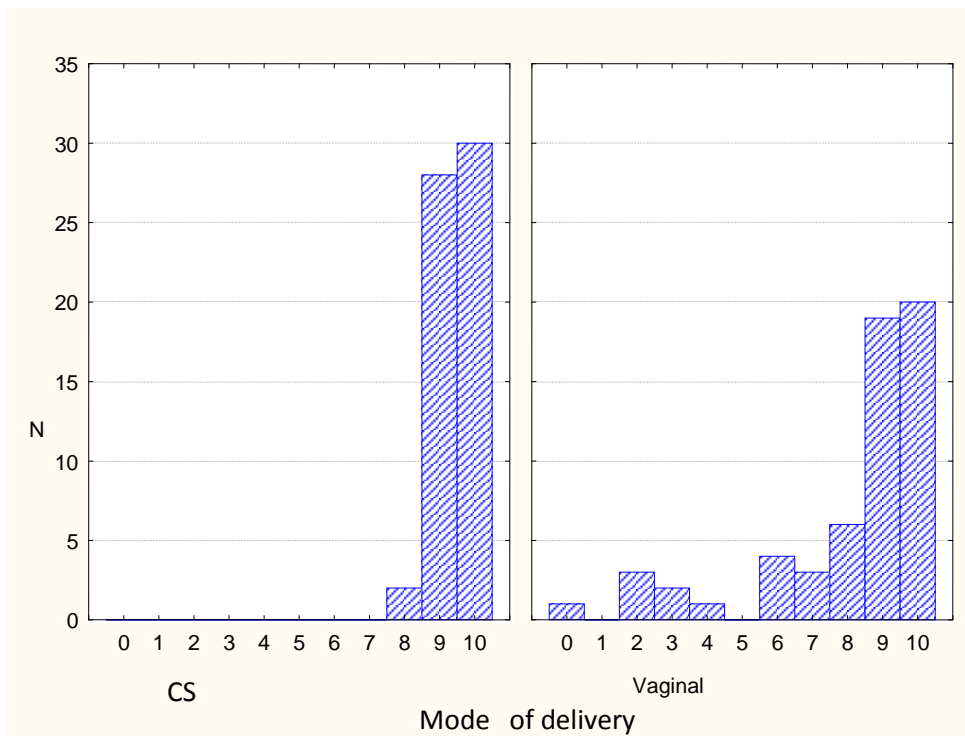


Figure 8

Ten minute Apgar scores



Appendix A:

Data Sheet:

Number:

A- Maternal

General

1. Study number (patient names kept separately)
2. Age
3. Gravida Para Miscarriage Top Ectopic
4. Gestation at booking: (in weeks)
5. Gestation at attempted version: N.A/ number of weeks
6. Gestation at onset of labour: (in weeks)
7. Breech diagnosed antenatally: yes/no
8. Planned mode of delivery: a. vaginal b. elective caesarean section
9. Mode of delivery: a. vaginal
 - i. Duration of 1st stage
 - ii. Duration of 2nd stage
 - iii. Augmentation with oxytocin requires: Yes/No
 - iv. Delivery done by nurse or doctor (medical officer/registrar/consultant)
 - v. Use of a forceps to deliver the after coming head: Yes/No
- b. Caesarean section:
 - i. Anaesthetic – spinal / epidural / failed spinal or epidural + general / general
 - ii. Intra-operative complications
10. Blood loss
11. Blood transfusion required
12. Perineal injury/Episiotomy
13. Post-operative complications:
 - Fever (38° or more)
 - Wound infection
 - Lung complications
 - Other

B- Neonatal

- 1, Apgars: 5min /10min
2. Birth weight:
3. Sex: male/female
3. Neonatal:
 - Admission to high or critical care: Yes/No
 - Discharged with mother: Yes/No
4. Birth trauma
5. Seizures: Yes/No
6. Death: no/antenatal/perinatal/postnatal
7. Other

b. On average how many do you perform per year?

- i. 0 – 10
- ii. 10-20
- iii. > 20

c. Can you think of case(s) managed personally where there was **neonatal mortality** related to the delivery? If yes, how many? And please elaborate.

d. Can you think of case(s) managed personally where there was **neonatal morbidity** related to the delivery? If yes, how many? Please name the complication(s) and elaborate.

e. Can you think of a case(s) managed personally where there was **maternal mortality** related to the delivery? If, yes, how many and please elaborate.

f. Can you think of a case(s) managed personally where there was **maternal morbidity** related to the delivery? If, yes, how many and please name the complication(s) and elaborate.

g. Which manoeuvre(s) do you use during an assisted breech delivery in the following circumstances?

Legs if frank breech _____

Arms if flexed over chest _____

After coming foetal head _____

4. Do you think clinicians are properly trained at Tygerberg Hospital to perform vaginal breech delivery? Yes / No

Please clarify your answer:

5. Do you think the current approach to the delivery of breech-lying neonates is appropriate?

Yes / No

Please clarify your answer:

Other comments:
