

# How long does a fetal scalp blood sample take?

D Tuffnell, WL Haw, K Wilkinson

Department of obstetrics and Gynaecology, Bradford Royal Infirmary, Duckworth Lane, Bradford, UK

Correspondence: Dr DJ Tuffnell, Bradford Royal Infirmary, Duckworth Lane, Bradford, West Yorkshire BD9 6RJ, UK.

Email derek.tuffnell@bradfordhospitals.nhs.uk

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The study aim was to identify the time from a decision to perform a fetal blood sample to the result of the test being available. A total of 100 consecutive fetal scalp blood samples taken on women in labour were identified from the blood gas analysers on the delivery suite. Eighty-nine percent of attempts yielded a result. The median time taken was 18 minutes (interquartile range 12–25 minutes). In 9% of women, the result took longer than 30 minutes. This is important clinically when repeated testing is required or in the

second stage when operative vaginal delivery is achievable. Furthermore, when retrospectively analysing cases with a poor outcome, the time to obtain a result needs to be taken into account when determining the time at which a baby could have been delivered.

**Keywords** Fetal acidosis, fetal blood sample, fetal hypoxia, fetal monitoring, labour.

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## Introduction

Fetal monitoring in labour aims to detect significant fetal hypoxia leading to fetal acidemia. This process has profound clinical and legal ramifications. In the 1960s, Bretscher and Saling<sup>1</sup> pioneered the technique of fetal scalp pH analysis for intrapartum assessment of fetal wellbeing. They suggested pH cutoff values as normal ( $>7.25$ ), preacidosis (7.20–7.25) and acidosis ( $<7.20$ ). Consequently, they recommended a repeat of fetal scalp pH within 20–30 minutes if preacidosis was found and to expedite delivery in cases with acidosis. This guideline is still regarded as the ‘gold standard’, with respect to the diagnosis of intrapartum fetal distress.<sup>2</sup>

While there is no standard method for the collection of fetal scalp blood, most UK practitioners collect individual drops of fetal capillary blood in a heparinised glass tube following scalp skin puncture with a small blade, a fetal blood sample (FBS).<sup>3,4</sup> The UK’s National Institute of Clinical Excellence (NICE) guideline on caesarean section suggests that when caesarean section is contemplated because of an abnormal fetal heart pattern, an FBS should be offered if it is technically possible and there are no contraindications.<sup>5</sup> An FBS should therefore precede the majority of decisions to expedite delivery because of abnormal fetal heart rate patterns. The time taken to obtain an FBS result is therefore just as important as the decision delivery interval for operative vaginal delivery or caesarean section. Despite this, there are no published objective data on the time taken to perform this process.

This study was undertaken in a busy teaching hospital to objectively assess the time involved.

## Methodology

A series of 100 consecutive FBS on vertex-presenting fetuses were examined over the period from 1 May 2004 to 1 September 2004. The cases, together with the timing of each result, were collected daily from the record in the micro blood analyser database. The clinical staff were aware of the audit and recorded time of decision to perform the test, the time the procedure was started and the operator grade. The operator also recorded the number of attempts for each FBS in the case notes. Those women in whom an FBS was attempted but an inadequate sample obtained were also included in the analysis. If no sample was obtained, the case was excluded. The AVL Omni machine was used for the analysis. It provides a full gas analysis on a 0.1 ml sample in less than 2 minutes. The maternity unit has two micro blood analysers on the delivery suite, and so there were no delays in getting a result from the machine due to recalibrating or washing. As this was an audit of current practice, ethics committee approval was not considered necessary.

## Results

One hundred fetal scalp pH results on 74 babies were reviewed. Eighty-nine were successful, and 11 were inadequate

for the analysis. Overall, the median time interval between decision to perform the test and the results was 18 minutes (interquartile range [IQR] 12–25 minutes). In 35 (39.5%) of the successful FBS, the time taken was more than 20 minutes, and in eight (9%), it took more than 30 minutes. The median time for preparation was 5 minutes (IQR 5–10 minutes), and the median time to obtain a sample was 14 minutes (IQR 10–18 minutes). Figure 1 shows the proportion with a result by time. For 19 samples, the cervical dilatation was less than 4 cm and for these, a result was obtained in a median time of 20 minutes (IQR 16–22 minutes). In 12 of these 19 cases (63%), a vaginal delivery was achieved. In 25 cases, the cervical dilatation was 5–7 cm, with a median sampling time of 25 minutes (IQR 17–28 minutes). In the remaining 45 women with a cervical dilatation of 8–10 cm, the median sampling time was 16 minutes (IQR 11–21 minutes).

The actual pH results and the time to get the results were recorded in 88 cases. In the ten cases with a pH result of less than 7.20, the median time was 24 minutes (IQR 13–25 minutes) compared with 20 minutes (IQR 16–28 minutes) for the 65 cases with a pH above 7.25.

In 59 of 88 successful samples (67%), results were obtained from the first sample in a median time of 17 minutes (IQR 13–22 minutes). When two or three attempts were needed, the median time was 22 minutes. In four cases, four or five attempts were made before a result was obtained. These took 26, 27, 46 and 70 minutes. In one case, the number of attempts was not recorded.

In 92 cases, the operator was a middle-grade doctor. The numbers of operators in other grades were too small for valid comparison. In 55 cases, the woman was in the left lateral position and a sample was obtained in 51. The median time for these results was 16 minutes (IQR 12–21 minutes) and in five, the pH was below 7.20. In 41 cases, the woman was in the lithotomy position and a sample was obtained in 34. The median time was 25 minutes (IQR 20–28 minutes) and in five, the pH was below 7.20. In six women, the position was not recorded.

Only one baby was admitted to special care baby unit. The reason for the admission was prematurity at 35 weeks of

gestation rather than poor delivery condition or umbilical cord pH. All the cases were singleton pregnancies except one twin pregnancy. The FBS was performed on the first twin, with a reassuring fetal heart rate pattern on the second twin.

In 11 cases, the FBS failed to obtain a sample. In six cases, the FBS failed the first time it was attempted and five cases in which it failed were women who had had a successful previous FBS in the same labour. The median cervical dilatation was 6 cm (IQR 5–6 cm). There was a maximum of four attempts. The median time taken before abandoning was 26 minutes (IQR 16–32 minutes).

## Discussion

When delivery has to be expedited for suspected fetal distress by caesarean section, a maximum decision delivery interval of 30 minutes has become an accepted standard. This is despite doubts about whether this can always be achieved and a lack of evidence that this improves outcome. The NICE guideline on caesarean section suggests that a fetal scalp pH should be used to confirm concern about the condition of a fetus before undertaking caesarean section.<sup>5</sup> There is no previous literature on the time interval between decision and result for this diagnostic test. Therefore, the time taken for this procedure to be carried out should be considered when discussing the interval between the identification of concern about a fetus and the time when delivery will be achieved. In this study, the median decision to result interval was 18 minutes.

In 11% of our cases, no result was obtained. This is a lower failure rate than the rate in the series analysed by Westgren *et al.*,<sup>6</sup> who reported a 20% failure rate. However, we may have missed some cases where attempts were made but no sample at all was obtained. There is no standard set for the number of attempts that should be made to obtain an FBS before abandoning the procedure—this is currently dependent on the operator. Increasing the number of attempts increases the interval to a result. In our study, the decision to result interval of those needing more than three attempts was at least 20 minutes. We suggest that after three failed attempts, the operator should reconsider the situation with a view to abandoning the procedure.

In our series, 21.3% of FBS were at a cervical dilatation of less than 4 cm. Within our unit, there is sometimes a debate about whether the procedure should be attempted at all in this group of women. Subgroup analysis on the data in this group shows that 63% of the women went on to achieve vaginal delivery. This suggests that FBS is still worth performing on women in this situation. Furthermore, 73% of cases in this study with sufficiently abnormal fetal heart rate patterns to justify an FBS had a pH of greater than 7.25. This emphasises the importance of undertaking an FBS in order to avoid unnecessary intervention.

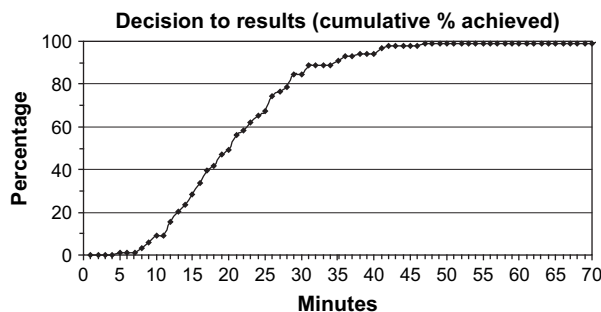


Figure 1. Percentage of successful FBS by time.

As with all procedures, FBS can be broken down into elements. In some cases, there was quite a prolonged time before the attempt started. This was due to the staff being busy with other matters or the woman needing analgesia (usually an epidural ‘top-up’) before the procedure could begin. Once the woman was in position and the obstetrician available, the median time taken to get the result was 14 minutes. This is a particularly important point when repeat samples are needed for a borderline result or for a persistently abnormal cardiotocograph (CTG) with an earlier normal pH. It means that preparations should begin 10–15 minutes before the time at which a repeat result is required. It is also important in the second stage of labour, if operative delivery is possible, to recognise the lag time inherent in taking an FBS.

There is little doubt that CTG interpretation is subject to variation outside the perfectly normal and grossly abnormal traces, even among obstetrics experts. In this 4-month period, we had 1797 deliveries, with an FBS performed in 4.1% of cases. Few studies of FBS rates are available, but another study reports a rate of 8.2%.<sup>6</sup> Research into FBS rates in a range of units might provide a useful insight into the quality of CTG interpretation.

This study has identified the time taken under standard circumstances in a busy but appropriately staffed unit to gain a result from an FBS. The median time was 18 minutes, but in

9% of cases, the time taken was more than 30 minutes. In cases with a poor outcome, retrospective analysis may result in criticism of the timing of the delivery, with expert opinions given as to the time at which the baby should have been delivered with ‘reasonable’ care. When these views are put forward, it should be acknowledged that an FBS is part of the decision-making process and the time taken to perform it should be accounted for when suggesting an optimal ‘time of delivery’. ■

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