Clinical significance of amniotic fluid bacteriological cultures taken at Caesarean section

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Summary: To predict postoperative infection after Caesarean section by bacteriological examination of amniotic fluid samples a prospective analysis was performed on amniotic fluid bacteriological results and infectious morbidity in 266 consecutive Caesarean sections. Culture and sensitivity results were analysed in relation to postoperative febrile complications and their antibiotic treatment. One hundred and twelve samples grew bacteria. There was a significantly higher frequency of postoperative pyrexial complications among those patients with a positive amniotic fluid culture (22.3% vs 14.2%). Eighty per cent of amniotic fluid samples with significant bacterial growth provided useful information when antibiotic treatment had been required. Routine amniotic fluid sampling for bacteriology at Caesarean section is of clinical value in the prediction and management of postoperative pyrexial complications.

Key words: Amniotic fluid; bacteriology; Caesarean section.

INTRODUCTION

Methods for early detection of fetal and maternal risk situations have undergone great development during the last few decades. Advances in diagnostic methods, operative techniques and improved paediatric services have resulted in a significant increase in Caesarean section rate ([1, 6, 11, 15]). Infection is the most frequent puerperal complication and it occurs 10-30 times more frequently after Caesarean section then following vaginal delivery ([8]). High infectious morbidity has demanded large scale research for identification of risk factors and methods of prevention ([10, 13, 14, 16]).

In an attempt to predict postoperative infection, amniotic fluid samples were taken at 266 consecutive Caesarean sections for bacteriologic investigations. Culture and sensitivity results were analysed in relation to postoperative febrile complications and their antibiotic treatment.

PATIENTS AND METHODS

Amniotic fluid samples were taken at Caesarean section in 266 consecutive cases.

The samples were collected immediately after the uterine incision was made. 5-10 ml of amniotic fluid was aspirated into a sterile syringe and seeded onto transport culture medium within 30 minutes. Samples for aerobic and anaerobic cultures were sent separately. Before transfer-

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ring to differential media, samples were kept at 37 °C for not more than 24 hours.

Cases developing temperatures of at least 38 °C on two consecutive days, except the first postoperative day, were considered as having a febrile complication.

RESULTS

The overall frequency of postoperative febrile morbidity was 16.4% among 266 patients following Caesarean section. During the study 297 Caesarean sections were performed in the reporting institute. In 31 cases amniotic fluid sampling could not be performed due to uterine bleeding or because multiple pregnancy made the surgeon abandon the sampling.

General bacteriological results of 266 amniotic fluid cultures are shown on table 1. Table 2 shows the aerobic and anaerobic culture of 112 samples (42.1%) which resulted bacterial growth.

Twenty-five (22.3%) out of 112 patients with positive amniotic fluid culture developed a febrile complication in the postoperative period compared with 14,2% of 154 patients with no bacterial growth in amniotic fluid culture ($\chi^2=4.18$, $p<0.025$).

Seventy six patients (25.5%) were given antibiotic treatment in the postoperative period. Most of them (42 patients, 14.1%) received a therapeutic course because of febrile complication. Thirty patients (11.4%) were given prophylactic antibiotic treatment. Antibiotic prophylaxis was indicated by prolonged rupture of membranes or prolonged labour. Ampicillin was the drug of first choice, but in case of hypersensitivity Erythromycin or Cephalexin was given.

Table 1. — *General results of amniotic fluid bacteriological cultures.*

Aerob.	Anaerob.	N.
Negative	Negative	109
Negative	—	34
—	Negative	11
Negative	Positive	15
Positive	Negative	36
Positive	Positive	11
Positive	—	47
—	Positive	3
Total		266

Table 2. — *Bacterium strains isolated from amniotic fluid samples.*

Aerob.	N.
Staph. epidermidis	41
Staph. aureus	17
E.coli	12
Streptococcus genus	9
Pseudomonas group	7
Yeasts	5
β-hemolysing group B. Str.	4
Bacillus genus	4
Str. faecalis	3
Micrococcus genus	3
Klebsiella group	2
Gram positive bacillus	2
Acinetobacter	1
A-B-C- group streptococc.	1
Alcaligenes faecalis	1
α-hemolysing streptococc.	1
Bacillus cereus	1
Citrobacter	1
Moraxella	1
Proteus inconstans	1
Sarcina	1
Total	122

Anaerob.	N.
Streptococcus genus	12
Peptostreptococcus	7
Bacteroides genus	3
Staph. epidermidis	2
Acinetobacter	1
α-hemolysing streptococcus	1
E.coli	1
Klebsiella group	1
Non-hemolysing streptococcus	1
Yeasts	1
Staph. aureus	1
Total	31

Table 3. — *Bacteriology results of patients received antibiotics for postoperative infection.*

	Prophylactic course	Therapeutic course
N. of cases	30	42
Postoperative pyrexia	3	42
Positive culture	1	25
Negative culture	2	17

Table 4. — *Antibiotic treatment of patients with positive amniotic fluid culture.*

Isolated bacteria	1st line antibiotic	1st line antibiotic +transfus.	2nd line antibiotic
Sensitive to 1st line	9	0	0
Sensitive and resistant to 1st line	9	2	3
Resistant to 1st line	1	0	1
Total	19	2	4

There have been two basic forms of antibiotic prophylaxis reported in the literature so far. Results of short term prophylaxis consisting of one or three doses were reported to be superior to those lasting for at least four days ([7, 12, 13]). No significant difference in efficacy of the two major groups of β-lactam antibiotics has been reported ([7]).

The number of positive and negative cultures among patients treated with antibiotics are shown on table 3.

Table 4 shows analysis of antibiotic treatments in relation to sensitivity results of positive culture. Among those cases where the in vitro test showed no sensitivity to the ex juvantibus chosen drug, four patients required new or additional antibiotic. Bacteriological results of 14 cases confirmed sensitivity to the first chosen drug and further two results suggested discontinuation of prophylactic antibiotic treatment.

DISCUSSION

Analysis of 266 consecutive cases of Caesarean section revealed a 16.4% prevalence of postoperative pyrexial complications. Frequency of infectious complications was found to be significantly higher among those patients whose amniotic fluid culture showed bacterial growth (22.3% vs 14.2%). Twenty-five patients developed febrile complication in the positive culture group. Bacteriological examination of their amniotic fluid samples showed aerobic growth in 17 cases and 8 cultures revealed anaerobic pathogens. *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa* and *β-haemolytic Streptococci* were most commonly isolated aerobic pathogens and among anaerobic bacteria, *Peptostreptococci* and *Bacteroides* were most frequently identified.

Amniotic fluid bacteriology provided useful information for deciding further management in 20 out of 25 cases receiving antibiotic treatment for febrile complication following Caesarean section.

The frequency of febrile morbidity following Caesarean section was found to be 13.3% by Nielsen ([15]). In his series, a presenting part below the spine, prolonged rupture of membranes exceeding 16 hours, longer than 16 hours labour, less that 12.0 g/100mL hemoglobin and obesity were identified as the most important predisposing factors for postoperative infection. He proposed to decrease the emergency section rate or to perform section in earlier stage of labour and prophylactic use of antibiotics in high risk groups for reducing febrile morbidity of Caesarean section. Hawrylyshyn has shown that risk factors vary from institute to institute and should be characterized individually ([12]). This opinion seems to solve the controversy between those studies, one of which identifies the invasive methods of fetal monitoring as being a significant risk factor, while another report does not ([9, 17, 18, 19]). Similarly, rectal examination performed more than three times during labour has been shown to be a significant risk factor, but invasive fetal monitoring in the same patient popu-

lation did not increase the febrile morbidity ([19]). Many studies have dealt with bacteriological examination of amniotic fluid samples taken at Caesarean section, mainly from a pathogenetic point of view. Bacterium counts alone seem to influence the infection without regard to type of strain, and this author also demonstrated that non-pathogenic bacteria may play a role in the endometrium invasion ([3, 4]). Comparing the quality of specimens for identification of pathogens and commensals, Cooperman found membranes to be more suitable than liquor samples ([5]). A ninety per cent positive culture rate and 95% positive culture rate and 95% pelvic infection rate was reported by Gilstrap in those cases when the section was performed at least 6 hours after the rupture of the membranes ([10]). The spectrum of isolated bacteria was largely the same as in the present study .

In summary, bacteriological examination of amniotic fluid samples taken at Caesarean section is of clinical value in the prediction and management of postoperative pyrexial complications.

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