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A dipstick test for infection in preterm premature rupture of the membranes

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1 Introduction

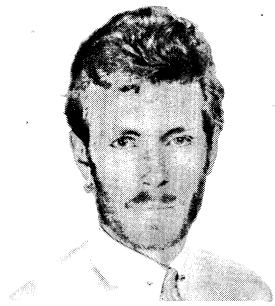
Conservative management regimes are increasingly used in preterm premature rupture of the membranes (PPROM), [16] following the recognition that perinatal deaths from prematurity exceed those from infection [1, 7]. Amniocentesis has been suggested in patients managed expectantly to reduce the remaining risk of infectious morbidity, by allowing early identification and delivery of patients with colonized liquor [9, 10]. Although ruptured membranes have previously been considered a contraindication to amniocentesis, the technique is successful in up to 70% in yielding uncontaminated liquor for microbiological analysis [4, 6, 9].

As standard cultures require 24–48 hours and laboratory services in most institutions are limited at night, a need exists for a rapid analysis that can be performed by the obstetrician. A dipstick which predicts the presence of leukocytes, is evaluated in this study for use in amniotic fluid.

2 Patients and methods

Twenty-five women with PPROM at gestational weeks ranging from 26 to 34 were entered into the study. An obvious pool of liquor was demonstrated in the posterior fornix of each on speculum examination. Patients were not in labor, had no clinical evidence of infection, and were not on antibiotics. All were considered suitable for conservative expectant management. Real time ultrasound identified accessible liquor pockets in 23, in whom transabdominal amniocentesis was attempted. An aseptic technique with povidone-iodine skin preparation was employed. No specimen was obtained in 3 despite two passages of the needle. Twenty-one samples were obtained from 20 patients (1 with diamnionic twins). Each sample was separated into two fractions: into one of 3 ml, the test strip ("Cytur-test", Boehringer Mannheim, GmbH) was dipped and read at 15 minutes, while microscopy and culture was performed in aerobic, anaerobic and mycoplasmal media on the other. In the presence of leukocytes, indoxyl ester in the white test strip is cleaved by granulocytic esterases to yield indoxyl, which oxidizes in air to the blue dye indigo. One heavily blood contaminated specimen stained the test strip, obscuring interpretation of color change and was excluded. Microscopy was omitted in two.

Curriculum vitae



NICHOLAS FISK *was born in 1956 in Australia. He graduated from the University of Sydney in 1980 and underwent his specialist training at King George V Hospital in Sydney. In 1983 he worked in the King Edward VIII Hospital in South Africa, and is currently a lecturer in the Department of Obstetrics and Gynecology at the University of Aberdeen, Scotland. His main interests are preterm labor and antenatal diagnosis.*

3 Results

Amniocentesis was successful in yielding liquor in 20 of the 23 (86.9%) patients on whom it was attempted. Overall, liquor samples were obtained in 20 of the 25 patients (80%) with PPROM. In 7 of the samples, the dipstick read ≥ 25 leukocytes per μl, whilst uncentrifuged microscopy demonstrated significant leukocytes (≥ 2 leukocytes per oil immersion field x 1,000) in 5. A micro-organism was cultured (≥ 10^3 colonies per ml) in 6 specimens. As a predictor of a positive culture, the test strip gave one false negative and two false positives, whilst microscopy produced one of each (figure 1). Both tests yielded similar sensitivities and specificities (table I). Each proved less predictive of histological acute diffuse chorioamnionitis (using a membrane roll technique [3]) due to 6 patients with a negative culture and positive histology. All these delivered > 48 hours after amniocentesis, suggesting that infection complicated rather than caused their PPROM. All patients with both positive dipstick and microscopy had a positive culture and histological confirmation of infection, whereas the 10 with both tests negative had sterile liquor.

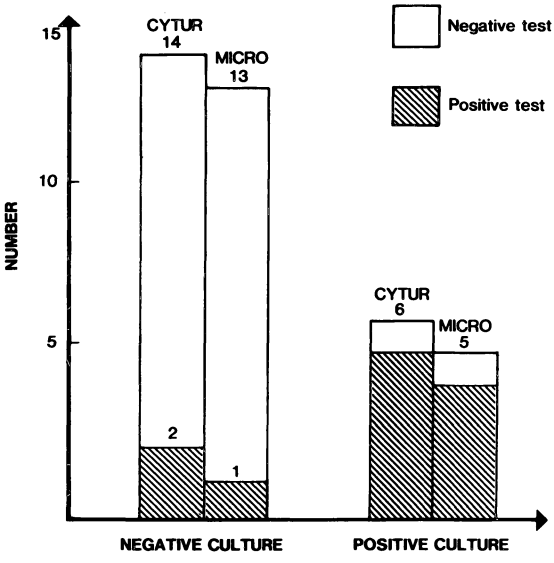


Figure 1. Presence or absence of leukocytes as predicted by the "Cytur-test" (CYTUR) or microscopy (MICRO) in patients with and without an organism on liquor culture.

4 Discussion

Microscopy, Gram stain, and culture of amniotic fluid obtained by amniocentesis in PPROM are known to have predictive value for chorioamnionitis [4, 6, 10, 11, 15, 23]. Liquor culture improved 5 minutes Apgar when intervention is based on a positive result. Nevertheless a role remains for slightly less accurate but more rapid investigation, especially where immediate decisions on management, such as tocolysis, are needed. The Cytur-test, which detects leukocytic esterases, was initially designed for use in urine [2], but has also been used in peritoneal dialysate [5] and seminal fluid [17]. This pilot study suggests that the dipstick test is as accurate as microscopy in predicting colonized liquor, yielding similar sensitivities (83% and 80% respectively) and specificities (86% and 92%). The advantage of the dipstick, however, is that it can be performed simply and rapidly at the bedside by the obstetrician. These accuracies were improved further by combining both tests, so that a positive dipstick and microscopy was 100% specific and positively predictive from the limited numbers in this study, while either test positive proved 100% sensitive and negatively predictive of a positive culture. Although other predictors of infection have been suggested in PPROM, such as biophysical profiles [18], fetal breathing [20], gas liquid chromatogra-

Table I. Accuracy of dipstick and microscopy for polymorphs as predictors of a positive liquor culture.

	Dipstick	Microscopy	Dipstick and microscopy	Dipstick or microscopy
Sensitivity	83.3%	80%	60%	100%
Specificity	85.7%	92.3%	100%	76.9%
Positive predictive value	71.4%	80%	100%	62.5%
Negative predictive value	92.3%	92.3%	86.7%	100%

phy [13], liquor volume [12], C-reactive protein [8] and cardiotocography [19] none have been shown superior to liquor culture [14, 21, 22]. The Cytur-test merely aids in the rapid prediction of a positive culture, and is not suggested as an alternative predictor of chorioamnionitis.

Summary

Microbiological analysis of amniotic fluid obtained by amniocentesis is increasingly employed in preterm premature rupture of the membranes (PPROM) to predict those patients at increased risk of chorioamnionitis. Although liquor culture appears the most accurate predictor, a role exists for rapid but slightly less accurate testing. In this study, a dipstick (Cytur-test) which predicts the presence of leukocytes was evaluated in amniotic fluid. Twenty-one samples were obtained by amniocentesis from 25 women with PPROM at gestation 26–34 weeks. The dipstick predicted 5 out of 6 specimens with a positive culture and 12 of 14 with a negative culture (figure 1). Its accuracy as a predictor of a positive culture was similar to microscopy for polymorphs, with sensitivities of 83.3% and 80% respectively and specificities of 85.7% and 92.3%. Neither test proved as predictive of histological chorioamnionitis due to 6 patients delivering > 48 hours after amniocentesis who may have developed infection subsequent to the demonstration of sterile liquor.

Keywords: Amniocentesis, chorioamnionitis, fetal membranes, premature rupture, preterm labor, PPROM.

Zusammenfassung

Ein Teststreifen zur Diagnostik des Amnioninfektionssyndroms bei vorzeitigem Blasensprung

Die mikrobiologische Analyse von durch Amniozentese gewonnenem Fruchtwasser wird zunehmend zur frühzeitigen Diagnose des Amnioninfektionssyndroms bei vorzeitigem Blasensprung angewandt. Obwohl die Fruchtwasserkultur die exaktesten Analysen ermöglicht, besteht eine Nachfrage für einen weniger exakten, dafür aber schnelleren Test. In dieser Studie wurde ein Teststreifen (Cytur-Test), der auf Leukozyten anspricht, in Fruchtwasser erprobt. 21 Proben wurden mittels Amniozentese von 25 Frauen mit vorzeitigem Blasensprung in der 26.–34. Woche gewonnen. Der Teststreifen korrelierte in 5 von 6 Proben mit einer positiven Kultur, und in 12 von 14 Proben mit einer negativen Kultur (Abb. 1). Seine Genauigkeit zur Voraussage einer positiven Kultur entsprach der einer mikroskopischen Untersuchung auf Polymorphien mit einer Empfindlichkeit von 83,3% bzw. 80% und einer Spezifität von 85,7% bzw. 92,3%. Keiner der beiden Tests zeigte eine histologische Fruchtblasenentzündung an, die bei sechs Frauen gefunden wurden, die mehr als 48 Stunden nach der Amniozentese ihre Kinder bekamen. Bei diesen Frauen könnte sich eine Infektion nach dem Nachweis eines sterilen Fruchtwassers entwickelt haben.

Schlüsselwörter: Amniozentese, Amnioninfektionssyndrom, Fruchtblase, vorzeitiger Blasensprung, vorzeitige Wehen.

Résumé

Batonnets diagnostiques d'infection dans la rupture prématurée des membranes

On utilise de plus en plus l'analyse microbiologique du liquide amniotique obtenu par amniocentèse an cas de rupture prématurée des membranes (RPM) pour prédire quelles patientes seront à risque élevé de chorioamniotite. Bien que la mise en culture du liquide apparaisse comme l'élément prédictif le plus approprié, il existe une place pour des tests rapides mais un peu moins fiables. Dans cette étude nous avons évalué la valeur de batonnets réactifs (cytur-test) qui prédisent la présence de leucocytes, au niveau du liquide amniotique. Vingt et un prélèvements ont été obtenus chez 25 femmes avec RPM à 26–34 semaines gestationnelles. Les batonnets ont été positifs pour 5 des 6 liquides dont la culture était positive et négatifs pour 12 des 14 liquides dont la culture était négative (figure 1). La fiabilité des batonnets comme prédicteur d'une culture positive est similaire à l'examen au microscope, avec une sensibilité respectivement de 83,3% et de 80% et une spécificité de 85,7% et de 92,3%. Aucun des tests n'a prouvé une valeur prédictive pour une chorioamniotite histologique secondaire chez 6 patientes ayant accouché plus de 48 heures après l'amniocentèse et qui ont présenté une infection secondaire alors que le liquide amniotique était stérile.

Mots-clés: Accouchement prématuré, amniocentèse, chorioamniotite, membranes fœtales, R. P. M., rupture prématurée.

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