



***REVIEW OF THE USE OF
NITRAZINE YELLOW SWABS
IN PRE-LABOUR RUPTURE OF
MEMBRANES*** Fiona Dickinson, Hora Soltani & Jonathon Allsop



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REVIEW OF THE USE OF NITRAZINE SWABS IN PRE-LABOUR RUPTURE

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Abstract

This review is aimed to investigate the effectiveness of nitrazine yellow in the diagnosis of ruptured fetal membranes (RoM) prior to the onset of labour. A structured literature search was carried out which identified 6 relevant studies.

When the findings of these six studies were synthesised, they gave a combined sensitivity of 91.6% and specificity of 66.4%. They also highlighted the possible contaminant effects of semen and vaginal infection. It was felt that the influence of these might be reduced with the use of a screening tool but that further research was needed.

Background

The pre-labour, spontaneous rupture of fetal membranes occurs in, between 1% and 4.5% of pregnancies less than 37 weeks gestation (Lee et al 2003; Mercer et al 2000) and for 6-19% of term births (Enkin et al 2000). The accurate diagnosis of pre-labour rupture of membranes may be fairly obvious but in some situations the diagnosis is not so easy, in which case a test is required to confirm or refute the presence of liquor in the vagina. There are a number of possible methods of doing this, with varying degrees of convenience and accuracy. These include: the use of nitrazine impregnated swabs (such as Amnicator); the 'fern' test; identification of beta-HCG in vaginal washing fluid; and injection of dyes into the amniotic sac via abdominal amniocentesis.

Nitrazine is a pH indicator, which turns from yellow to blue-green/black when in contact with substances with a pH of greater than 6.5-7.0. It is found in different types and shapes including plastic swabs with a synthetic fibre bud or paper strips. The former is a self contained device which shows the result directly on the swabs but the latter reveals the results after rubbing the swabs on the paper strips.

Objectives

To investigate the effectiveness of nitrazine yellow, in diagnosing pre-labour rupture of membranes.

Methods

A search strategy was developed for a number of different databases including Medline and Embase, to identify research studies using nitrazine yellow. Within this review, all studies were included which assessed the effectiveness of nitrazine yellow as a method of diagnosis for ruptured membranes.

Results

Six research studies were identified, which used nitrazine as either the only method of determining ROM, or in comparison with other methods. Most of these studies compared nitrazine with other detection methods, and used a repeated measures design, allowing these data to be extracted and analysed in combination.

In the presence of liquor these studies gave a range of true positives (sensitivity) of between 77% and 100% (see table 1) with an average of 91.6%. In the stated absence of liquor the true

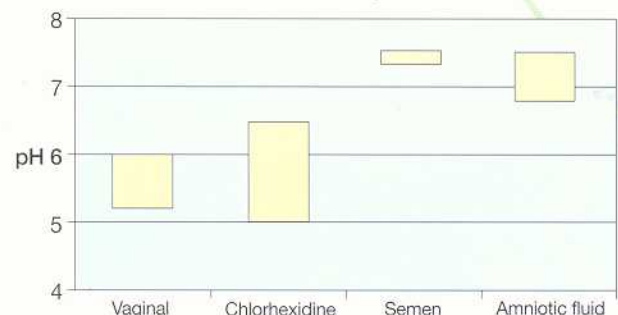
Table 1. Finding of nitrazine tests: liquor present (% (n/N))

| Study | Positive | False Negative | Equivocal |
|---------------------------|--------------|----------------|-------------|
| Mills & Garrioch (1977) | 100 (81/81) | 0 | 0 |
| Rochelson et al (1987) | 77 (37/48) | 12.5 (6/48) | 10.4 (5/48) |
| Garite & Gocke (1990) | 91.3 (21/23) | 8.7 (2/23) | |
| Filet et al (1994) | 97.5 | | |
| Kishida et al (1996) | Cervical | 96.9 (31/32) | 3.1 (1/32) |
| | Vaginal | 81.3 (26/32) | 18.8 (6/32) |
| Erdemoglu & Mungan (2004) | 97 | | |

Table 2. Finding of nitrazine tests: liquor absent (% (n/N))

| Study | Negative | False positive | Equivocal |
|---------------------------|--------------|----------------|-------------|
| Mills & Garrioch (1977) | Pre ARM | 92.3 (36/39) | 8 (3/39) |
| | Non pregnant | 19 (4/21) | 81 (17/21) |
| Rochelson et al (1987) | 80.6 (25/31) | 16.1 (5/31) | 3.2 (1/31) |
| Garite & Gocke (1990) | 72.7 (16/22) | 27.3 (6/22) | |
| Filet et al (1994) | 93.3 | | |
| Kishida et al (1996) | Cervical | 57.1 (8/14) | 42.9 (6/14) |
| | Vaginal | 100 (14/14) | 0 (0/14) |
| Erdemoglu & Mungan (2004) | 16 | | |

Table 3. pH values for possible vaginal contaminants



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negatives ranged between 19% and 100% (see table 2) with an overall average specificity of 66.4%. The findings of pH tests on possible vaginal contaminants show that semen has a pH similar to liquor (see table 3).

Discussion

The six included studies show a wide variation in both sensitivity and specificity. One of the issues which appears to have had an influence on this is the difference in pH levels classified as a positive result. In Rochelson et al (1987) study a positive result was classed as a pH > 7.0 giving a relatively low positive rate, whilst in Garite & Gocke (1990) the positive level was lower at pH > 6.0 resulting in a high false positive rate. Filet et al (1994) used a positive level of pH > 6.5 which appears to give a better balance between specificity and sensitivity.

In Mills & Garrioch (1977) study, the non-pregnant controls were recruited from a Venereal Disease clinic and of the 17 women who tested positive, 15 had either an active vaginal infection or a recent history of gonorrhoea. The 4 women who tested negative with nitrazine showed no signs of vaginal infection. This would strongly suggest that at least some vaginal infections will produce an elevated pH result when tested with nitrazine. The same study also stated that the pH of semen is between 7.3 and 7.5 making it another possible contaminant that would produce a false positive result when testing women for the presence of amniotic fluid. Chlorhexidine lotion and cream were found to have a pH of between 5 and 6.5 depending on the water used to make up the solutions.

Within the studies that compared pregnant women with and without a history of RoM, diagnosing intact membranes is difficult to confirm. The difficulty in demonstrating conclusively that there is no risk of hind water leak would bring into question the results of the tests carried out on pregnant women with no history of RoM. Mills & Garrioch (1977) suggest that one of their false positive results may have been due to the swab coming into contact with the fetal membranes during the test. This seems to be supported as a possible confounding variable by Kishida et al (1996) when the proportion of false positives between their samples taken from the cervix and the vagina are compared (43% Vs 0% respectively). The cervical samples in this study, however, seem to show a higher sensitivity in comparison to the vaginal samples (97% Vs 81%, respectively).

Within the designs of the studies that use a repeated measures design, this might influence the second test results either by contaminating the sample remaining or reducing the quantity of liquor left. The only real way of neutralising this effect is to alter the order in which the tests are carried out, although this

may not be desirable without causing much more problematic contamination. The manufacturers of Amnicator recommend the use of a speculum to reduce the risk of contamination.

Conclusions

Six studies were identified that looked at the effectiveness of nitrazine, with or without comparison to other tests. These gave widely varying results due to a number of factors but an overall sensitivity of 91.6 % and a specificity of 66.4%.

Contaminants, which appear most likely to confound the results were semen with a pH of approx. 7.5 and vaginal infection. Contact with the fetal membranes may also contaminate the test results. Further research to quantify more clearly the degree of influence these contaminants might have, and the production of a screening tool to identify their potential presence, could significantly improve the sensitivity and specificity of this cheap and easy test for pre-labour RoM.

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