Low plasma sodium concentration predicts perforated acute appendicitis in children, a prospective observational cohort study

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Background and aims

Recent research on appendicitis suggests the benefit of early differentiation of perforation from non-perforation in modern treatment algorithms. Based on pilot study data we hypothesise that plasma sodium concentration at hospital admission may help predict disease severity in children with acute appendicitis, i.e. if perforation is present or not.

Methods

In this prospective observational cohort study, previously healthy children, 1–14 years of age, with suspected acute appendicitis were screened for inclusion. Blood sampling was performed prior to intravenous rehydration and/or drug treatment and included plasma sodium concentration, plasma glucose, base excess, white blood cell count, and C-reactive protein.

Results

80 children with histopathologically confirmed acute appendicitis were included in the study. Median plasma sodium concentration in patients with perforated acute appendicitis (134 mmol/L (IQR 132–136)) was significantly lower than in children with non-perforated acute appendicitis (139 (IQR 137–140)). The receiver operating characteristic curve of plasma sodium concentration at admission identifying patients with perforated acute appendicitis showed an area under the curve of 0.93 (95% CI 0.87–0.99). A cut-off value of plasma sodium concentration of ≤ 136 mmol/L resulted in a sensitivity and specificity of 0.82 (95% CI 0.70–0.90) and 0.87 (95% CI 0.60–0.98) respectively. Plasma sodium concentrations ≤ 136 mmol/L resulted in an odds ratio of 31.9 (95% CI 6.3–161.9) for perforation. The association between low plasma sodium concentration and perforated acute appendicitis was confirmed in a multivariate logistic regression analysis.

Conclusions

Low plasma sodium concentration is a strong predictor for perforation in acute appendicitis in children and its use may improve the care of patients with acute appendicitis.

Fig 1. Receiver operating characteristic (ROC) curve for plasma sodium concentration as a predictor of perforated acute appendicitis. AUC is area under the curve, dashed line is the line of no predictive value i.e. AUC = 0.5.

Fig 2. Plasma sodium concentration dichotomised at ≤ 136 mmol/L. Dark bars denote perforated acute appendicitis, grey bars non-perforated acute appendicitis. Odds ratio was 31.9 (95% CI 6.3–161.9) by Fisher's exact test.