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Original Research Article

Three-year experience with prolonged neonatal jaundice screening in a district general hospital

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ABSTRACT

Background: Investigations for prolonged jaundice vary in complexity, especially in well neonates. The aim was to ascertain the causes of prolonged jaundice in well neonates and to analyse the extent and consistency of investigations performed.
Methods: We performed a retrospective review of nurse-led prolonged jaundice screening in our children's assessment unit from 2013 to 2016. The proforma included clinical assessment and recommended investigations. Data from electronic records and laboratory findings were compiled for analysis.
Results: A total of 116 infants aged 14-73 days were referred for screening, with 100% utilization of the screening proforma. All patients had unconjugated hyperbilirubinaemia with normal urine and stool colour. Of the 113 with a full blood count performed, 74 (65.5%) were normal, with neutropenia in 32 (28.3%) and 1 blood film showing spherocytosis with haemolysis. Urine culture was performed in 106 infants, yielding 2 pure-growth cultures in infants subsequently treated for urinary tract infection (UTI) (1%). Seventy-four infants had one or more additional tests. The causes of prolonged jaundice identified were breast-milk jaundice (97), feeding difficulties (7), UTI (2) and hereditary spherocytosis (1).
Conclusions: The most common cause of prolonged jaundice identified was breast-milk jaundice. The eldest referred infant was 73 days old, demonstrating a need for increased community awareness of guidelines to facilitate prompt referral. Additional investigations yielded little diagnostic value and we propose that in well neonates, following clinical evaluation, investigations may safely be reduced to full blood count and split bilirubin.

Keywords: Neonatal jaundice, Prolonged jaundice

INTRODUCTION

Prolonged jaundice is defined as hyperbilirubinaemia after 14 days in term neonates, and 21 days in preterm neonates. It is a common presenting complaint, with a reported incidence of 15%-40% in well infants at 2 weeks of age and in 9% at 4 weeks of age.[1,2]

Distinguishing between conjugated and unconjugated hyperbilirubinaemia is important for diagnosis. Unconjugated hyperbilirubinaemia is defined as a conjugated bilirubin level <20% of total bilirubin, the most common cause of which is breast-milk jaundice, with a reported incidence of 36% in the third week of life.[3,4] Alternative diagnoses include inadequate feeding, hypothyroidism, infection and pyloric stenosis.[5]

Conjugated hyperbilirubinaemia is defined as a conjugated bilirubin level >20% of the total bilirubin, associated with a history of dark urine and pale stools.[3] It is likely to indicate a more serious cholestatic pathology such as biliary atresia, hepatitis and metabolic disorders.[6]

The National institute for health and care excellence (NICE) recommend screening infants presenting with prolonged jaundice with stool colour, split bilirubin, full blood count, direct Coombs' test, urine culture and metabolic screening (if the Guthrie test was not performed). Conversely, the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition recommend split bilirubin testing and clinical assessment at 2 weeks, which can be delayed to 3 weeks in breast-feeding infants with normal stool and urine colour.[7,8]

Despite national guidelines, continued heterogeneity of investigations has resulted in significant variations in local practice.[1] We audited the use of our nurse-led prolonged jaundice proforma over 3 years to assess our adherence to the guidance and identify the causes in our cohort of patients.

METHODS

We performed a retrospective review of nurse-led prolonged jaundice screening in our children's assessment unit in a district general hospital from January 2013 to July 2016. Referrals were received from the community including general practitioners and midwives. The proforma, introduced in 2011, includes clinical assessment and recommended investigations. Data were collected from electronic records available from 2013, with information from scanned records and laboratory data compiled into an Excel datasheet.

RESULTS

Infant characteristics

A total of 116 well infants aged 14-73 days were referred for screening, all of whom were reviewed using the proforma. Of the infants, 70 were male and the majority were term babies (96). Feeding methods were largely breastfeeding (98), with 5 being formula fed and 9 having mixed feeds.

Investigations

All patients had unconjugated hyperbilirubinaemia with normal urine and stool colour and all had Guthrie bloodspot testing in the first weeks of life. Glucose-6-phosphate dehydrogenase testing was performed in 14 high-risk infants with no positive findings. Seventy-four infants had one or more investigations (Table 1). The findings demonstrate a marked variation of investigations performed, with uptake in patients ranging from 9% to 97%. Diagnostic value was determined if the test contributed towards a diagnosis.

Pathology

The causes of prolonged jaundice identified were breast-milk jaundice (97), feeding difficulties (7), urinary tract infection (UTI) (2) and hereditary spherocytosis (1). The diagnosis of feeding difficulty was made after a process of exclusion of other diagnoses in the 7 infants who had not regained birth weight by day 20 of life, all of whom were breast fed and ultimately regained appropriate growth trajectory.

Table 1: Investigations performed as PJ screening.

Investigation	n	% of total	Diagnostic contribution
Full blood count	113	97	1
Urea and electrolytes	35	30	0
Liver function tests	20	17	0
Thyroid function tests	18	15	0
C-reactive protein	10	9	1
Direct Coombs' test	60	51	0
Urine microscopy, culture and sensitivities	106	91	2
Glucose-6-phosphate dehydrogenase level	14	12	0

Clean-catch urine cultures were performed in 106 infants, 33 of which showed mixed growth, and 26 of which were repeated. Overall, 2 infants had pure growth of *Escherichia Coli*, one of which was in association with a deranged C-reactive protein, and both were subsequently treated for UTIs. The abnormal full blood count identified spherocytosis with haemolysis contributing to diagnosis of hereditary spherocytosis. This infant had a strong family history of this condition and the diagnosis was suspected prior to formal testing.

DISCUSSION

Timing

The oldest infant referred for prolonged jaundice screening was 73 days old. Figure 1 highlights the delay in referrals for our preterm and term infants, based on the guidelines for assessment at 14 days in term babies and 21 days in preterm.[9]

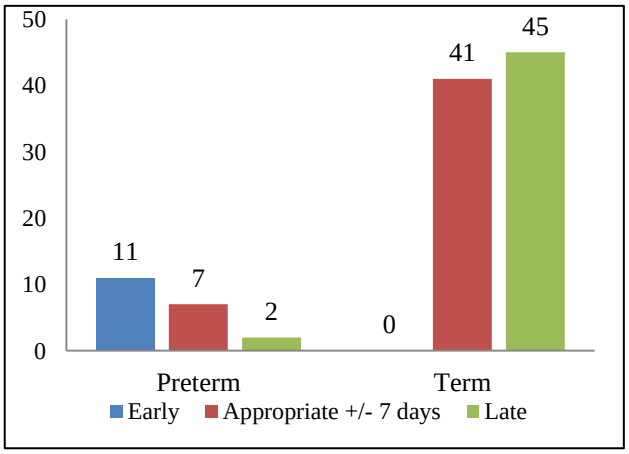

Figure 1: Referral times for preterm and term infants.

It is crucial that diagnoses of cholestatic causes are made early for prompt management, with surgery required by 60 days of age in the case of biliary atresia.[6] As the screening process itself relies on referrals from the community, further education and awareness would permit timely assessments of all infants with prolonged jaundice.

In addition to late referrals, our results identified 11 preterm infants who were referred before 21 days of age. This identifies a cohort of patients who were inappropriately referred and potentially underwent unnecessary investigations.

Investigations

Of the investigations performed, the number contributing to a diagnosis was minimal, indicating an excess of unnecessary investigations performed. Rodie et al investigated the cost associated with screening this cohort of patients and found it was up to £2625 per year in laboratory costs alone.[1] The study also highlighted a statistically significant association with fewer repeat investigations and outpatient appointments when screening investigations were limited to clinical examination, stool colour and split bilirubin.

Diagnosis

Figure 2 shows the causes of prolonged jaundice identified, with breast-milk jaundice as the most common cause, in concordance with the literature.[5] All infants had normal stool and urine colour with an unconjugated hyperbilirubinaemia, which allowed us to rule out pathological cause of cholestatic disease.[6,10]

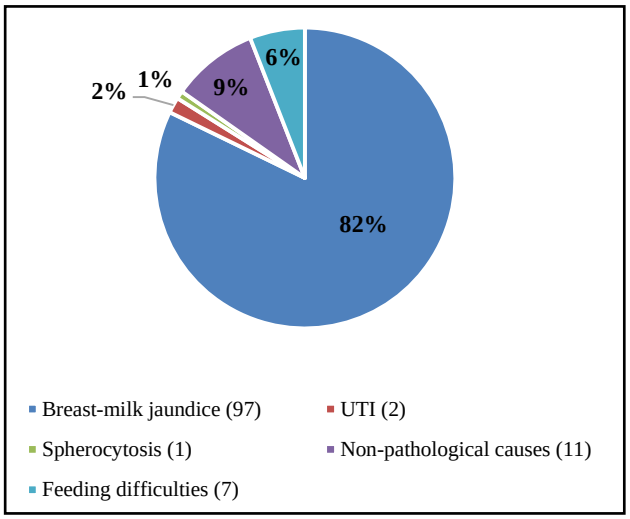

Figure 2: Causes of prolonged jaundice identified.

Our findings support previous research which suggests screening for UTIs in well infants is inappropriate due to the low yield of positive findings and difficulty obtaining reliable samples.[11,12] The evidence supporting the NICE guidelines for urine screening in prolonged jaundice is based on 3 studies.[13-15] Unal et al investigated 26 babies and none were found to have a UTI; Tiker et al retrospectively reviewed the cases of only 42 infants, of which 15 had positive urine cultures; and Hannam et al identified 2 positive urine cultures in 154 infants.[13-15]

CONCLUSION

Our study identified that we are over-investigating infants presenting with prolonged jaundice, and investigating many too late. As referrals are in large part from the community, additional education and awareness will allow prompt assessment of infants and prevent delays in diagnoses.

We agree with the increasing consensus among healthcare professionals that minimizing screening investigations for well infants with prolonged jaundice is safe and clinically appropriate. We propose a reconsideration of screening guidelines, such that in well neonates, following clinical evaluation, investigations may safely be reduced to stool colour, full blood count and split bilirubin. This tailored approach based upon the clinical picture is likely to provide cost-effective benefits, minimize wastage of healthcare resources and avoid undue parental anxiety.

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Ethical approval: Not required

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