

Disseminated *Escherichia coli* Sepsis with Multiple Visceral and Soft-tissue Abscesses as the Presenting Manifestation of Classic Galactosaemia in a Young Infant: A Case Report

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ABSTRACT

Classic galactosaemia, caused by deficient Galactose-1-Phosphate Uridyltransferase (GALT) activity, predisposes young infants to life-threatening *Escherichia coli* sepsis through galactose-metabolite-mediated immune dysfunction. A two-month-old breastfed male infant presenting with high-grade fever, poor feeding, and progressive swellings over the scalp, right thigh, and right axilla. Sepsis workup revealed leucocytosis, markedly elevated C-Reactive Protein (CRP), elevated hepatic transaminases, and *E. coli* bacteraemia. Contrast-Enhanced Computed Tomography (CECT) demonstrated multiple abscesses in the liver, spleen, and rectus abdominis muscle. Standard immunodeficiency evaluation was unremarkable. Urine reducing substances were positive for a non-glucose reducing sugar. Next-generation sequencing identified a heterozygous pathogenic GALT c.563A>G (p.Gln188Arg; Q188R) variant; the biochemical and clinical constellation was consistent with classic galactosaemia, with a likely second pathogenic allele not detected by the panel used. Immediate lactose elimination, prolonged intravenous meropenem, and image-guided abscess drainage resulted in complete clinical and radiological resolution. At 3-month post-discharge follow-up, the infant was thriving with no abscess recurrence. *E. coli* sepsis with multifocal abscesses should prompt metabolic evaluation for galactosaemia when immunodeficiency workup is unremarkable. Early recognition through bedside urine reducing substance testing, immediate elimination of dietary lactose and aggressive source control are pivotal to achieving a favourable outcome in this potentially fatal but treatable disorder.

Keywords: Inborn error of metabolism, Neonatal sepsis, Pyogenic abscess, Reducing substances

CASE REPORT

A two-month-old male infant was admitted to the Paediatric Intensive Care Unit (PICU) with a 5-day history of high-grade continuous fever without chills, progressive lethargy, and poor acceptance of feeds. Progressive swelling had been noted over the scalp, right thigh, and right axilla over the preceding five days. The scalp swelling was soft and fluctuant and the thigh and axillary swellings were tender and erythematous. He was born at term (38 weeks + 4 days) via normal vaginal delivery, with a birth weight of 3.1 kg, to non-consanguineous parents of Indian origin. The perinatal period was notable for prolonged neonatal jaundice persisting beyond the second week of life, attributed to breast milk jaundice and managed conservatively without formal metabolic investigation. The mother had been exclusively breastfeeding the infant since birth. Serial weight measurements revealed suboptimal weight gain (weight at presentation: 4.1 kg; expected: approximately 5.1 kg), consistent with failure to thrive. There was no family history of consanguinity, neonatal deaths, or known metabolic disorders. There was no history of trauma or fall and in particular no antecedent injury to the scalp to account for the parietal swelling. Developmental milestones appeared within normal limits prior to the acute illness. Vaccination history was up to date for age. Newborn screening for Inborn Errors of Metabolism (IEM) had not been performed at the birth facility.

On admission, the infant was febrile (temperature 39.4°C), tachycardic (heart rate 172/minute), tachypnoeic (respiratory rate 64/minute), and hypotensive (blood pressure 54/30 mmHg),

consistent with septic shock. Oxygen saturation was 90% on room air, necessitating immediate respiratory support. Anthropometric assessment confirmed weight-for-age below the 3rd centile.

Systemic examination revealed moderate pallor and mild icteric sclera. The liver was palpable 3.5 cm below the right costal margin with a span of approximately 8 cm; the spleen was palpable 2 cm below the left costal margin. Three fluctuant swellings were identified: a 4×3 cm collection over the right parietal scalp, a 3×2 cm collection in the right axilla, and a 5×4 cm collection over the anterior aspect of the right thigh. Central nervous system examination revealed generalised hypotonia with depressed neonatal reflexes (absent Moro reflex, depressed palmar grasp and rooting reflexes); no focal neurological deficits were elicited. Fontanelle was flat and normotensive. Initial laboratory parameters are presented in [Table/Fig-1].

Reducing substance testing of urine using Benedict's reagent demonstrated a positive result for a non-glucose reducing sugar, raising strong suspicion for galactosuria. Urine galactitol was subsequently found to be markedly elevated on targeted metabolomics.

CECT of the abdomen and pelvis demonstrated: (i) multiple hypodense, ring-enhancing lesions within the right lobe of the liver, the largest measuring 3.8×3.0 cm, consistent with pyogenic abscesses; (ii) a 2.5×2.1 cm splenic abscess in the posterior pole; and (iii) a 4.2×3.5 cm collection within the right rectus abdominis muscle. Hepatosplenomegaly was confirmed radiologically. No

intracranial abscess was detected on cranial ultrasonography. Ultrasonography of the soft-tissue swellings over the scalp, axilla, and thigh confirmed organised, hypoechoic collections amenable to drainage.

Investigations	Result/Findings	Reference range
Haemoglobin	8.8 g/dL (normocytic, normochromic anaemia)	10.5-14.0 g/dL
Total Leucocyte Count (TLC)	27,300 cells/mm ³ (neutrophilia 82%)	6,000-17,500 cells/mm ³
Platelet count	1,55,000/mm ³	1,50,000-4,00,000/mm ³
C-Reactive Protein (CRP)	256 mg/L (markedly elevated)	<5 mg/L
Serum ALT / AST	Mildly elevated (2× upper limit of normal)	ALT <45 U/L; AST <40 U/L
Serum bilirubin (total/direct)	3.1/1.6 mg/dL	Total <1.2 mg/dL; Direct <0.3 mg/dL
Serum albumin	2.8 g/dL (mildly reduced)	3.5-5.0 g/dL
Renal function tests	Within normal limits	Age-appropriate
Prothrombin time/INR	21.3 seconds/1.8 (mildly prolonged)	11-14 sec/0.8-1.2
Blood culture	<i>Escherichia coli</i> (sensitive to meropenem and aminoglycosides)	No growth
Urine culture	No growth	No growth
Blood glucose	3.0 mmol/L (low-normal)	2.8-5.5 mmol/L
Lactate	3.8 mmol/L (elevated)	<2.0 mmol/L
Ammonia	Within normal limits	<50 µmol/L
Serum galactose-1-phosphate	Elevated (>10 mg/dL)	<1 mg/dL
RBC GALT enzyme activity	<1% of normal (markedly reduced)	18-28 nmol/h/mg Hb
Urine reducing substances	Positive (non-glucose reducing sugar)	Negative
Immunoglobulin levels (IgG/IgA/IgM)	Normal for age	Age-appropriate
Lymphocyte flow cytometry (CD3/CD4/CD8/CD19/NK)	Normal subsets	Normal
Dihydrorhodamine (DHR) oxidative burst assay	Normal (CGD excluded)	Normal
2-D Echocardiogram	Normal; no vegetations	Normal
Urine amino acids/organic acids	Non-specific; no other IEM identified	Normal

[Table/Fig-1]: Initial laboratory, microbiological, radiological, immunological, and metabolic investigations at presentation.

ALT: Alanine aminotransferase; AST: aspartate aminotransferase; CD: cluster of differentiation; CGD: Chronic Granulomatous Disease; CRP: C-reactive protein; DHR: Dihydrorhodamine; GALT: Galactose-1-phosphate uridylyltransferase; Hb: Haemoglobin; IEM: Inborn error of metabolism; Ig: Immunoglobulin; INR: International normalised ratio; NK: Natural killer; RBC: Red blood cell; TLC: Total leucocyte count

Given the multifocal abscesses and septic presentation in early infancy, a structured differential diagnosis was considered and systematically excluded. Chronic Granulomatous Disease (CGD) was excluded by a normal dihydrorhodamine oxidative burst assay. Severe combined and other primary immunodeficiencies, including leucocyte adhesion defects, were considered unlikely given normal lymphocyte subsets on flow cytometry (CD3/CD4/CD8/CD19/NK) and age-appropriate immunoglobulin levels. Hyper-Immunoglobulin E (IgE) (Job) syndrome was considered improbable in the absence of eczema, characteristic facies, and with normal immunoglobulins. Disseminated staphylococcal sepsis with pyomyositis, a common

cause of multifocal abscesses in infancy-was excluded by isolation of *Escherichia coli* from both blood and drained pus rather than *Staphylococcus aureus*. Infective endocarditis with septic embolisation was excluded by a normal two-dimensional echocardiogram showing no vegetations. Alternative IEM were rendered unlikely by non-specific urine amino and organic acid profiles, while the elevated galactose-1-phosphate, galactosuria and markedly reduced red blood cell GALT enzyme activity established galactosaemia as the unifying diagnosis. This stepwise exclusion redirected the evaluation from a structural immunodeficiency toward a metabolically mediated functional immune defect.

A Next Generation Sequencing (NGS)-based IEM gene panel was dispatched in view of the atypical sepsis presentation. This revealed a heterozygous pathogenic variant c.563A>G (p.Gln188Arg; Q188R) in the GALT gene (NM_000155.4). As galactosaemia is an autosomal recessive disorder, a single heterozygous variant on NGS may reflect compound heterozygosity with a second pathogenic allele not captured by the panel used; the biochemical phenotype (elevated galactose-1-phosphate, galactosuria, and markedly reduced RBC GALT enzyme activity) is consistent with classic galactosaemia, with biallelic genetic characterisation pending. Sanger sequencing of both alleles and parental carrier testing were recommended for definitive genotyping. Dietary management was instituted without delay pending these results.

The infant was admitted to the PICU and intubated for respiratory failure secondary to septic shock. Empirical broad-spectrum antimicrobial therapy was commenced with intravenous meropenem (20 mg/kg/dose 8-hourly) and intravenous vancomycin (15 mg/kg/dose 6-hourly), the latter administered as empirical Gram-positive cover for seven days. Following isolation of *E. coli* sensitive to meropenem and aminoglycosides on blood culture, and with no Gram-positive pathogen identified, vancomycin was de-escalated (discontinued). Inj. meropenem was continued for a total of six weeks given the extensive abscess burden. Vasopressor support with intravenous dopamine 10 µg/kg/min, titrated to mean arterial pressure was required for 72 hours. The infant was successfully extubated on day 7.

Image-guided percutaneous pigtail catheter insertion was performed for the hepatic abscesses and rectus abdominis collection under real-time ultrasound and computed tomography guidance, after optimisation of the anaemia and coagulopathy noted on admission (haemoglobin 8.8 g/dL; prothrombin time/INR 21.3 s/1.8). The soft-tissue abscesses over the scalp, thigh, and axilla were drained surgically under general anaesthesia. Prior to surgical drainage, a pre-anaesthetic evaluation was undertaken comprising assessment of the airway, cardiorespiratory and haemodynamic status, correction of anaemia and coagulopathy, and confirmation of fitness for anaesthesia. Anaesthesia was induced and maintained with endotracheal intubation and standard paediatric monitoring, and source control was achieved by incision and drainage of each collection. Drained fluid was purulent and yielded *E. coli* on culture.

Breastfeeding was discontinued immediately upon suspicion of galactosaemia, and a soya-based lactose-free formula was commenced. Red blood cell GALT enzyme activity assay confirmed markedly reduced enzyme function (<1% of normal), corroborating the biochemical diagnosis. Calcium and vitamin D supplementation was initiated prophylactically.

The infant demonstrated progressive clinical improvement with defervescence by day 10, normalisation of inflammatory markers

by week 3, and resolution of hepatosplenomegaly by week 5. Serial ultrasonography confirmed complete resolution of all visceral abscesses. The infant was discharged after 42 days of hospitalisation (discharge weight: 4.7 kg). At 3-month post-discharge follow-up the infant was thriving with no evidence of abscess recurrence or new infectious complications. Follow-up ultrasonography confirmed sustained complete resolution of all previously documented collections. Developmental assessment and ophthalmological review for cataracts were scheduled as part of ongoing galactosaemia surveillance.

DISCUSSION

Classic galactosaemia arises from biallelic loss-of-function variants in GALT, resulting in toxic accumulation of galactose-1-phosphate (Gal-1-P) and galactitol in tissues [1]. Beyond causing hepatocellular dysfunction, cataracts, and ovarian insufficiency, these metabolites impose a functional immunodeficiency by impairing polymorphonuclear leucocyte bactericidal activity-specifically by disrupting UDP-galactose-dependent glycoconjugate synthesis, thereby attenuating leukocyte adhesion, transmigration, and oxidative burst [2,3]. Galactitol additionally acts as an intracellular osmotic toxin. This mechanism accounts for the well-established susceptibility of galactosaemic infants to gram-negative bacteraemia, particularly *E. coli*, whose polysaccharide capsule confers resistance to phagocytosis in the setting of diminished opsonophagocytic function [3,4]. Crucially, these immunological defects are metabolically mediated: structural immune effectors- lymphocyte subsets, immunoglobulin levels, and Dihydrorhodamine (DHR) oxidative burst remain intact, as confirmed in the present patient. This distinguishes galactosaemia from primary immunodeficiencies such as CGD or hyper-IgE syndrome, which classically present with multiple abscesses in infancy [1,3].

The epidemiological link between galactosaemia and neonatal *E. coli* sepsis was established by Levy HL et al., (1977), who reported a strikingly disproportionate representation of galactosaemic neonates among those presenting with *E. coli* bacteraemia and meningitis [3]. Bosch AM (2006) subsequently confirmed Gram-negative sepsis as the principal acute life-threatening complication [1], and Waggoner DD et al., (1990) documented a significant burden of severe bacterial infections within the first year of life in affected patients [2]. The delayed presentation likely reflects a prolonged window of untreated bacteraemia secondary to incomplete penetrance of the metabolic defect in the exclusively breastfed state, permitting haematogenous seeding of metabolically stressed organs prior to antibiotic intervention.

The p.Gln188Arg (Q188R) substitution is the most common pathogenic GALT variant, accounting for approximately 60-70% of alleles in European ancestry populations [5]. It encodes a thermolabile enzyme with near-zero residual activity and is classified pathogenic per American College of Medical Genetics and Genomics (ACMG) and the Association for Molecular Pathology (AMP) criteria [4,5]. As galactosaemia is autosomal recessive, the detection of a single heterozygous Q188R allele on an NGS panel does not, in isolation, confirm biallelic disease. In the present patient, the biochemical phenotype-elevated Gal-1-P, galactosuria, and RBC GALT enzyme activity < 1% of normal-provided sufficient clinical evidence to support the diagnosis and justify immediate dietary intervention without awaiting genetic confirmation. Complete biallelic characterisation

via Sanger sequencing, deep intronic variant analysis, and parental testing remains recommended.

The diagnostic pathway in this case highlights several critical pitfalls. First, prolonged neonatal jaundice was attributed to breast milk jaundice without urine reducing substance testing-a missed opportunity for early diagnosis. Second, the absence of newborn IEM screening (not performed at the birth facility) precluded pre-symptomatic identification [6,7]. Third, the multiabscess phenotype directed initial evaluation toward primary immunodeficiency, delaying metabolic assessment. Urine reducing substance testing-simple, rapid, and inexpensive-was ultimately the pivotal diagnostic clue: a positive non-glucose reducing sugar in a septic, breastfed infant with hepatomegaly is near-pathognomonic of galactosaemia until proven otherwise [8].

Management required a multimodal approach [9]: immediate lactose elimination (soya-based formula) [10], prolonged intravenous meropenem for six weeks (consistent with paediatric pyogenic visceral abscess guidelines [8]), and image-guided percutaneous drainage for source control. The complete resolution of all abscesses on serial ultrasonography and absence of recurrence at follow-up attest to the efficacy of this combined approach. Early dietetic input and long-term metabolic surveillance including ophthalmological review for cataracts and developmental monitoring- are essential in survivors.

CONCLUSION(S)

This report describes a rare presentation of classic galactosaemia manifesting as *E. coli* sepsis with multiple visceral and soft-tissue abscesses in a two-month-old breastfed infant, diagnosed through positive urine reducing substances and NGS identification of a heterozygous GALT Q188R variant in the appropriate biochemical context. This case reinforces that multifocal abscess formation in a young infant with a normal immunodeficiency workup should prompt urgent metabolic evaluation, and that urine reducing substance testing remains an indispensable frontline diagnostic tool.

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REFERENCES

- [1] Bosch AM. Classic galactosaemia revisited. *J Inherit Metab Dis.* 2006;29(3):516-25.
- [2] Waggoner DD, Buist NR, Donnell GN. Long-term prognosis in galactosaemia: results of a survey of 350 cases. *J Inherit Metab Dis.* 1990;13(6):802-18.
- [3] Levy HL, Sepe SJ, Shih VE, Vawter GF, Klein JO. Sepsis due to *Escherichia coli* in neonates with galactosaemia. *N Engl J Med.* 1977;297(15):823-25.
- [4] Fridovich-Keil JL, Walter JH. Galactosaemia. In: Valle D, et al., editors. *The Online Metabolic and Molecular Bases of Inherited Disease.* 9th edition. Mc Graw-Hill; 2008.
- [5] Tyfield L, Reichardt J, Fridovich-Keil J, Croke DT, Elsas LJ, Strobl W, et al. Classical galactosaemia and mutations at the galactose-1-phosphate uridylyl transferase (GALT) gene. *Hum Mutat.* 1999;13(6):417-30.
- [6] Berry GT. Galactosaemia: when is it a newborn screening emergency? *Mol Genet Metab.* 2012;106(1):7-11.
- [7] Schweitzer-Krantz S. Early diagnosis of classic galactosaemia and benefit of a newborn screening programme. *J Inherit Metab Dis.* 2003;26(2-3):247-53.

[8]

Xie Y, Guo L, Liu B, Hu H, Hu B, Chen T et al. Pyogenic liver abscess in paediatric populations in Beijing (2008-2023). BMC Infect Dis. 2024 29;24:745.

[9]

Saudubray JM, Baumgartner MR, Walter J, editors. Inborn metabolic diseases: Diagnosis and Treatment. 6th ed. Berlin: Springer; 2016.

[10]

Camp KM, Lloyd-Puryear MA, Huntington KL. Nutritional treatment for inborn errors of metabolism: Indications, regulations and availability of medical foods and dietary supplements using phenylketonuria as an example. Mol Genet Metab. 2012;107(1-2):3-9.

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