International Journal of Research in Medical Sciences
Prazad A et al. Int J Res Med Sci. 2026 Jul;14(7):3118-3122
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20262209

Case Report

Severe hypercalcemia and nephrocalcinosis secondary to subcutaneous fat necrosis in a neonate with perinatal asphyxia: a case report

Amal Prazad[1], Aswathy Mathews[2]*

[1]Department of Emergency Medicine, Memorial Health System, Marietta, Ohio, United States of America
[2]Department of Internal Medicine, Government Sivagangai Medical College, Tamil Nadu, India

Received: 05 March 2026
Revised: 06 June 2026
Accepted: 23 June 2026

***Correspondence:**
Dr. Aswathy Mathews,
E-mail: aswathymathews1@gmail.com

ABSTRACT

Subcutaneous fat necrosis of the newborn (SCFN) is a rare, self-limiting panniculitis that occurs predominantly in full-term neonates following significant perinatal stress. Although the cutaneous manifestations often resolve spontaneously, SCFN can be complicated by severe and potentially life-threatening metabolic derangements, particularly hypercalcemia. We report the case of a 2.5-month-old female infant with a history of Grade 3 hypoxic–ischemic encephalopathy (HIE) who presented with multiple indurated subcutaneous nodules and profound hypercalcemia complicated by bilateral medullary nephrocalcinosis. Biochemical evaluation demonstrated suppressed parathyroid hormone levels with markedly elevated 1,25-dihydroxyvitamin D, consistent with PTH-independent hypercalcemia due to extra-renal vitamin D activation. Prompt recognition and aggressive multimodal therapy, including hyperhydration, calcitonin, and systemic corticosteroids, resulted in normalization of serum calcium levels. This case underscores the importance of early diagnosis, vigilant metabolic monitoring, and timely intervention in neonates with SCFN to prevent irreversible renal complications.

Keywords: Subcutaneous fat necrosis, Hypercalcemia, Nephrocalcinosis, Hypoxic–ischemic encephalopathy, Newborn

INTRODUCTION

Subcutaneous fat necrosis of the newborn (SCFN) is an uncommon inflammatory disorder of adipose tissue, typically affecting full-term or post-term infants exposed to perinatal stress such as hypoxic–ischemic injury, meconium aspiration, therapeutic hypothermia, or neonatal sepsis.[1] While SCFN is generally considered a benign and self-limiting dermatological condition, it may be associated with serious systemic complications, most notably hypercalcemia, which can lead to nephrocalcinosis, acute kidney injury, and long-term renal impairment.[1,2] Hypercalcemia in SCFN is mediated by granulomatous inflammation with unregulated extra-renal production of 1,25-dihydroxyvitamin D by activated macrophages. Because hypercalcemia may present weeks to months after the appearance of skin lesions, delayed diagnosis is common.[3,4] We describe a severe case of SCFN-associated hypercalcemia complicated by Grade 3 nephrocalcinosis in an infant with perinatal asphyxia.

CASE REPORT

The patient is a 2.5-month-old female infant from Nanded, India, born of a third-degree consanguineous marriage. Her birth history was significant for a term delivery via Lower segment cesarean section (LSCS) necessitated by Meconium-stained liquor (MSL). The infant did not cry at birth, had a birth weight of 3 kg, and required a 14-day NICU stay for Grade 3 HIE, neonatal seizures,

encephalopathy, and sepsis. She was discharged on a regimen of levetiracetam, phenytoin, and eltroxin for hypothyroidism. At the time of presentation, she exhibited global developmental delay, microcephaly, and increased tightness in all four limbs, consistent with evolving cerebral palsy. The primary reason for referral was the development of multiple hard swellings over her body, which began at 1.5 months of age.

Table 1: Initial laboratory investigations (18/06).

Parameters	Results	Interpretations
Hemoglobin (Hb)	11.2 g/dl	Within acceptable range for age
Hematocrit (HCT)	39.3%	Normal
Total count (TC)	16,000 /mm³	Mild leukocytosis
Platelet count (PLT)	8.4 lakh/mm³	Thrombocytosis
Sodium (Na)	133 meq/l	Mild hyponatremia
Chloride (CL)	99 meq/l	Normal
Potassium (K)	5.8 meq/l	Mild hyperkalemia
Total calcium (Ca)	19.3 mg/dl	Severe hypercalcemia
Ionized calcium (ICa)	2.27 mmol/l	Markedly elevated
Alkaline phosphatase (ALP)	195 IU/l	Within normal limits
Blood urea nitrogen (BUN)	16 mg/dl	Normal
Creatinine	0.38 mg/dl	Normal
SGPT (ALT)	5 IU/l	Normal

Interpretation

The investigations reveal severe hypercalcemia (total calcium 19.3 mg/dl) with elevated ionized calcium, which is the most significant abnormality in this case of suspected subcutaneous fat necrosis. Thrombocytosis is also present, which is a known metabolic association of SCFN. Renal parameters are within normal limits at presentation, although imaging later demonstrated nephrocalcinosis, likely secondary to prolonged hypercalcemia. Electrolyte abnormalities include mild hyponatremia and hyperkalemia. These findings support the diagnosis of SCFN complicated by significant hypercalcemia requiring urgent management.

These lesions initially appeared on the bilateral arms and thighs before progressing to the cheeks, nape, and buttocks. The swellings were described as firm and tender to touch, though the overlying skin appeared normal with no redness or discharge. Prior to her admission at Wadia Hospital, she had been treated by a local physician with a sequence of antibiotics- cefpodoxime, azithromycin, and amoxyclav and vitamin D (400 IU) without any resolution of the lesions. On physical examination, the infant was afebrile and hemodynamically stable, though she was severely underweight with a Z-score of <-3SD for weight and weight-for-height. Skin examination revealed widespread areas of thickening that were firm, tender, and non-pinchable. Neurological assessment confirmed spasticity, with a tone of +3 and the presence of clonus in both upper and lower limbs. These clinical findings, combined with her birth history, led to a primary diagnostic suspicion of Subcutaneous Fat Necrosis (SCFN).

Table 2: Hormonal and metabolic evaluation.

Tests	Result	Reference range	Interpretation
Vitamin D (25-OH)	34 ng/ml	30-100 ng/ml	Sufficient
1,25-OH vitamin D	153 ng/ml	50-190 ng/ml	Normal (upper range)
Parathyroid hormone (PTH)	2.31 pg/ml	15-65 pg/ml	Suppressed
Urine calcium/ creatinine ratio	3.95	<0.8	Markedly elevated

Interpretation

The child demonstrates suppressed PTH in the presence of severe hypercalcemia, indicating a PTH-independent mechanism. Elevated urinary calcium excretion confirms significant hypercalciuria. Normal but relatively high 1,25-OH Vitamin D levels support increased vitamin D–mediated calcium activity, consistent with subcutaneous fat necrosis–related granulomatous activation.

Table 3: Serial electrolyte and calcium monitoring.

Date	Na (meq/l)	Cl (meq/l)	K (meq/l)	Total calcium (mg/dl)	Ionized calcium (mmol/l)
19/06	140	108	5.3	16.3	2.0
200/6	137	104	4.0	—	1.85
210/6	134	107	3.7	11.8	1.49
22/06	139	102	4.5	10.8	1.24
24/06	—	—	—	10.3	1.17

Interpretation

Serial monitoring shows a steady decline in serum calcium and ionized calcium levels following initiation of therapy. The normalization of calcium by 24/6 indicates effective response to hydration, calcitonin, and steroid therapy. Electrolytes remained largely stable during treatment.

Laboratory investigations performed upon admission revealed a critical metabolic state characterized by profound hypercalcemia. The initial serum calcium was measured at 19.3 mg/dl (normal 9-11 mg/dl) with an ionized calcium of 2.27 mmol/l. To investigate the cause of hypercalcemia, a specialized hormonal profile was obtained. Parathyroid hormone (PTH) was found to be suppressed at 2.31 pg/ml (Normal 15-65 pg/ml), and 1,25-dihydroxyvitamin D was measured at 153 ng/ml. These results, along with a significantly elevated urine calcium-

to-creatinine ratio of 3.95, pointed toward a PTH-independent mechanism of hypercalcemia. Additional metabolic abnormalities included hypertriglyceridemia (414 mg/dl) and hypercholesterolemia (247 mg/dl). Ultrasound of the kidneys, ureters, and bladder (USG KUB) revealed Bilateral Grade 3 medullary nephrocalcinosis, indicating significant renal calcium deposition. The combination of characteristic skin lesions, history of perinatal asphyxia, and these metabolic markers confirmed the diagnosis of Subcutaneous fat necrosis of the newborn (SCFN) with associated secondary hypercalcemia and renal complications.

Table 4: Thyroid function tests.

Tests	Results	Reference range	Interpretation
FT3	3.48 pg/ml	2-4 pg/ml	Normal
FT4	2.06 ng/dl	0.9-2 ng/dl	Upper normal
TSH	0.935 µIU/ml	0.7-8 µIU/ml	Normal

Interpretation

Thyroid function is within normal limits, suggesting adequate control of congenital hypothyroidism on ongoing thyroxine therapy.

Management of the child was directed at rapidly lowering serum calcium levels to prevent further renal injury. The patient was started on aggressive hyperhydration at 3 l/m²/day (twice the maintenance volume) to promote renal calcium excretion. Calcitonin was administered at 2 U/kg every 6 hours for its rapid effect on inhibiting osteoclast function and inducing calciuresis. Systemic corticosteroids, in the form of prednisolone (2 mg/kg/day), were initiated to reduce the granulomatous inflammation and directly inhibit the macrophage-mediated conversion of Vitamin D.

The patient's clinical response was favorable, with serum calcium levels normalizing over the course of six days, dropping from 16.3 mg/dl to 10.3 mg/dl. Her electrolyte balance remained stable throughout the treatment. She was discharged on a tapering dose of oral Prednisone (2 mg/kg/day for 14 days) with instructions for close metabolic follow-up.

DISCUSSION

SCFN is an uncommon but clinically significant form of neonatal panniculitis that predominantly affects full-term or post-term infants exposed to perinatal stress.[5] The condition is rarely idiopathic; recognized precipitating factors include perinatal asphyxia, meconium aspiration syndrome, therapeutic hypothermia, neonatal sepsis.[6-8] In the present case, Grade III Hypoxic-ischemic encephalopathy (HIE), neonatal seizures, and prolonged intensive care admission likely constituted the principal triggers for adipose tissue injury.[6-8] Such severe neurological insults are frequently associated with adverse neurodevelopmental outcomes, including cerebral palsy and developmental delay.[9]

Clinically, SCFN presents with firm, erythematous-to-violaceous, non-pitting subcutaneous nodules or plaques involving areas rich in adipose tissue, particularly the cheeks, shoulders, back, buttocks, and proximal extremities.[10,11] These lesions may be tender during the active inflammatory phase and should prompt careful evaluation for associated metabolic complications.[12] Early recognition is essential because systemic manifestations may occur even when cutaneous findings appear benign.[13]

Hypercalcemia represents the most serious complication of SCFN and has been reported in up to one-quarter of affected infants.[14] The characteristic biochemical profile includes markedly elevated serum calcium concentrations accompanied by suppressed parathyroid hormone levels.[15] Hypertriglyceridemia and hypercholesterolemia may also occur secondary to adipocyte necrosis and lipid mobilization.[16] Persistent hypercalciuria can subsequently lead to nephrocalcinosis, nephrolithiasis, and renal dysfunction.[17]

The pathogenesis of SCFN is closely related to the unique composition of neonatal adipose tissue, which contains a relatively high proportion of saturated fatty acids.[18] Perinatal hypoxia and tissue injury promote crystallization of these fats, resulting in adipocyte necrosis and granulomatous inflammation.[19] Histopathological studies have demonstrated infiltration by macrophages, multinucleated giant cells, and inflammatory cells surrounding necrotic adipocytes.[20,21]

The mechanism underlying hypercalcemia in SCFN resembles that observed in granulomatous disorders such as sarcoidosis.[22] Activated macrophages within granulomatous lesions express extrarenal 1-alpha-hydroxylase, which catalyzes the conversion of 25-hydroxyvitamin D to biologically active 1,25-dihydroxyvitamin D.[23,24] This unregulated process bypasses normal endocrine feedback mechanisms, resulting in increased intestinal calcium absorption and enhanced osteoclastic bone resorption.[25,26]

Sustained hypercalcemia may result in nephrocalcinosis and acute kidney injury, both of which carry the potential for long-term renal sequelae.[17,27] Calcium deposition within the renal parenchyma can produce tubular injury and impaired renal function.[28] Additional reported complications include thrombocytopenia, thrombocytosis, hypoglycemia, and hyperlipidemia, reflecting the systemic inflammatory response associated with SCFN.[29]

Management of SCFN-associated hypercalcemia requires prompt and aggressive intervention. Initial treatment consists of intravenous hyperhydration to promote renal calcium excretion.[30] Loop diuretics such as furosemide may be administered following adequate hydration to enhance urinary calcium clearance.[17] Corticosteroid

therapy suppresses macrophage-mediated 1-alpha-hydroxylase activity and reduces vitamin D–mediated calcium production.[23] In severe or refractory cases, bisphosphonates such as pamidronate and, less commonly, calcitonin have demonstrated efficacy in rapidly lowering serum calcium levels.[31]

Although the cutaneous lesions of SCFN generally resolve spontaneously, metabolic complications may persist for several months after apparent dermatological recovery.[23] Therefore, regular monitoring of serum calcium concentrations is recommended until complete resolution of lesions and normalization of biochemical parameters. The long-term prognosis largely depends on the severity of nephrocalcinosis and the extent of underlying neurological injury resulting from the initial perinatal insult.[27,31] In resource-limited settings, early diagnosis, multidisciplinary management, and long-term surveillance remain critical for preventing irreversible complications and optimizing outcomes.

CONCLUSION

Subcutaneous fat necrosis of the newborn, though often regarded as a self-limiting dermatological condition, can be associated with severe and potentially life-threatening metabolic complications. This case illustrates the critical link between perinatal asphyxia and SCFN, emphasizing severe hypercalcemia mediated by extra-renal vitamin D activation and complicated by advanced nephrocalcinosis. The delayed onset of metabolic derangements despite early skin manifestations underscores the necessity for prolonged biochemical surveillance in affected infants. Early recognition, prompt exclusion of PTH-dependent causes, and aggressive multimodal therapy, including hyperhydration, calcitonin, and systemic corticosteroids, are essential to prevent irreversible renal injury. Clinicians caring for neonates with significant perinatal stress should maintain a high index of suspicion for SCFN and ensure structured long-term follow-up to mitigate adverse outcomes.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Gomes MP, Porro AM, Enokihara MM, Floriano MC. Subcutaneous fat necrosis of the newborn: clinical manifestations in two cases. An Bras Dermatol. 2013;88(1):154-7.
2. Muzy G, Mayor SAS, Lellis RF. Subcutaneous fat necrosis of the newborn: clinical and histopathological correlation. An Bras Dermatol. 2018;93(3):412-4.
3. Feng Z, Guo B, Zhang Z. Subcutaneous fat necrosis of the newborn associated with hypercalcemia after therapeutic hypothermia. J La State Med Soc. 2014;166:97-9.
4. Oliveira ACS, Selores M, Pereira O. Fat necrosis of the newborn: report on two cases. An Bras Dermatol. 2011;86(1):S114-7.
5. Canpolat N, Ozdil M, Kurugoglu S, Caliskan S, Sever L. Nephrocalcinosis as a complication of subcutaneous fat necrosis of the newborn. Turk J Pediatr. 2012;54:667-70.
6. Oza V, Treat J, Cook N, Tetzlaff MT, Yan A. Subcutaneous fat necrosis as a complication of whole-body cooling for birth asphyxia. Arch Dermatol. 2010;146(8):882-5.
7. Tran JT, Sheth AP. Complications of subcutaneous fat necrosis of the newborn: a case report and review of the literature. Pediatr Dermatol. 2003;20(3):257-61.
8. Fenniche S, Daoud L, Benmously R, Ben Ammar F, Khelifa I, Chaabane S. Subcutaneous fat necrosis: report of two cases. Dermatol Online J. 2004;10:12.
9. Ricardo-Gonzalez RR, Lin JR, Mathes EF, McCalmont TH, Pincus LB. Neutrophil-rich subcutaneous fat necrosis of the newborn: a potential mimic of infection. J Am Acad Dermatol. 2016;75(1):177-85.
10. Zeb A, Darmstadt GL. Sclerema neonatorum: a review of nomenclature, clinical presentation, histological features, differential diagnoses and management. J Perinatol. 2008;28(7):453-60.
11. Paige DG, Gennery AR, Cant AJ. The neonate. In: Burns T, Breathnach S, Cox N, Griffiths C, editors. Rook's Textbook of Dermatology. 8th ed. Massachusetts: Blackwell Publishing; 2010:590-2.
12. Burden AD, Krafchik BR. Subcutaneous fat necrosis of the newborn: a review of 11 cases. Pediatr Dermatol. 1999;16(5):384-7.
13. Mahé E, Girszyn N, Hadj-Rabia S, Bodemer C, Hamel-Teillac D, De Prost Y. Subcutaneous fat necrosis of the newborn: a systematic evaluation of risk factors, clinical manifestations, complications and outcome of 16 children. Br J Dermatol. 2007;156(4):709-15.
14. Strohm B, Hobson A, Brocklehurst P, Edwards AD, Azzopardi D. Subcutaneous fat necrosis after moderate therapeutic hypothermia in neonates. Pediatrics. 2011;128(2):e450-2.
15. Gupta RK, Naran S, Selby RE. Fine needle aspiration cytodiagnosis of subcutaneous fat necrosis of newborn: a case report. Acta Cytol. 1995;39:759-61.
16. Parvathidevi GK, Vijayashankar MR, Belagavi CS, Deepak, Vijaya, Narendra G, et al. Cytological diagnosis of subcutaneous fat necrosis of newborn: a case report. Dermatol Online J. 2005;11:20.
17. Bonnemains L, Rouleau S, Sing G, Bouderlique C, Coutant R. Severe neonatal hypercalcemia caused by subcutaneous fat necrosis without any apparent cutaneous lesion. Eur J Pediatr. 2008;167:1459-61.
18. Lombardi G, Cabana R, Bollani L, Del Forno C, Stronati M. Effectiveness of pamidronate in severe neonatal hypercalcemia caused by subcutaneous fat necrosis: a case report. Eur J Pediatr. 2009;168:625-7.

19. Wessling-Assmann K, Traupe H, Bonsmann G, Metze D. Subcutaneous fat necrosis of the newborn. J Dtsch Dermatol Ges. 2003;1(4):297-9.
20. Norwood-Galloway A, Lebwohl M, Phelps R, Harrist T. Subcutaneous fat necrosis of the newborn with hypercalcemia. J Am Acad Dermatol. 1987;16:435-9.
21. Shane E, Dinaz I. Disorders of mineral metabolism. In: Favus M, editor. Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism. 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2006:176.
22. Metz MP. Determining urinary calcium/creatinine cut-offs for the paediatric population using published data. Ann Clin Biochem. 2006;43(5):398-401.
23. Alos N, Eugène D, Fillion M, Powell J. Pamidronate: treatment for severe hypercalcemia in neonatal subcutaneous fat necrosis. Horm Res. 2006;65(6):289-94.
24. Ghergherehchi R. Complication of subcutaneous fat necrosis of the newborn: a case report and review of the literature. Res J Biol Sci. 2008;3(9):1004-7.
25. Sharata H, Postellon D, Hashimoto K. Subcutaneous fat necrosis, hypercalcemia, and prostaglandin E. Pediatr Dermatol. 1995;12(1):43-7.
26. Veldhuis JD, Kulin HE, Demers LM. Infantile hypercalcemia with subcutaneous fat necrosis: endocrine studies. J Pediatr. 1979;95(3):460-2.
27. Zissel G, Prasse A, Müller-Quernheim J. Immunologic response of sarcoidosis. Semin Respir Crit Care Med. 2010;31(4):390-403.
28. Kist-van Holthe JE, Van Zwieten PHT, Schell-Feith EA, Zonderland HM, Holscher HC, Wolterbeek R, et al. Is nephrocalcinosis in preterm neonates harmful for long-term blood pressure and renal function?. Pediatrics. 2007;119(3):468-75.
29. Huang J, Coman D, McTaggart SJ, Burke JR. Long-term follow-up of patients with idiopathic infantile hypercalcaemia. Pediatr Nephrol. 2006;21(11):1676-80.
30. Khan N, Licata A, Rogers D. Intravenous bisphosphonate for hypercalcemia accompanying subcutaneous fat necrosis: a novel treatment approach. Clin Pediatr (Phila). 2001;40(4):217-9.
31. Farooque A, Moss C, Zehnder D, Hewison M, Shaw N. Expression of 25-hydroxyvitamin D3-1alpha-hydroxylase in subcutaneous fat necrosis. Br J Dermatol. 2009;160(2):423-5.

Cite this article as: Prazad A, Mathews A. Severe hypercalcemia and nephrocalcinosis secondary to subcutaneous fat necrosis in a neonate with perinatal asphyxia: a case report. Int J Res Med Sci 2026;14:3118-22.