

Case Report

Subcutaneous Fat Necrosis of the Newborn

Srisupalak Singalavanija MD*,
Wanida Limponsanurak MD*, Titaporn Wannaprasert MD*

* *Dermatology Unit, Queen Sirikit National Institute of Child Health, Department of Medical Service,
Ministry of Public Health, College of Medicine, Rangsit University*

Subcutaneous fat necrosis of the newborn (SCFN) is an uncommon disorder in full term infants who have a perinatal condition. The authors reported seven cases of subcutaneous fat necrosis of the newborn at Queen Sirikit National Institute of Child Health from 2002 to 2005. All cases were term babies with four male cases, and three female cases. Five cases (70%) had perinatal asphyxia. The mean age of onset was 14 days (range 3-42 days). The locations of SCFN were back (3 cases), shoulder (2 cases), arm (2 cases), buttock (1 case), and neck (1 case). Skin biopsy was performed in three cases and was compatible with subcutaneous fat necrosis. The treatment was supportive with close monitoring of serum calcium. Hypercalcemia was seen in five cases (70%) and three cases were treated with oral prednisolone. Cutaneous lesions of all cases resolved without sequelae.

In conclusion, infants with subcutaneous fat necrosis should have serial serum calcium determinations and should be observed closely for signs and symptoms of hypercalcemia such as irritability, anorexia, constipation, and failure to thrive.

Keywords: *Subcutaneous fat necrosis of the newborn, Hypercalcemia*

J Med Assoc Thai 2007; 90 (6): 1214-20

Full text. e-Journal: <http://www.medassocthai.org/journal>

Subcutaneous fat necrosis of the newborn (SCFN) is an uncommon, benign process in full term infants who experienced perinatal distress. It is characterized by indurated, erythematous nodules or plaques over bony prominences such as the back, arms, buttocks, thighs, and face. The condition may be associated with maternal disorders such as diabetes, preeclampsia, or perinatal complications such as birth asphyxia, cord accidents, meconium aspiration, cold injury, hypothermia, hypoxemia, and hypoglycemia⁽¹⁻⁶⁾. It is a temporary, self-limited condition of unknown pathophysiology. Hypercalcemia is a rare complication, which can be life threatening if not treated adequately⁽⁷⁾.

There have been few case reports of SCFN and mainly single case reports⁽⁸⁻¹²⁾. The authors herein report a series of seven cases of SCFN seen at Queen Sirikit National Institute of Child Health during 2002-2005.

Correspondence to : Singalavanija S, Dermatology Unit, Queen Sirikit National Institute of Child Health, 420/8 Rajvithi Rd, Bangkok 10400, Thailand. Phone: 0-2354-8439, E-mail: srisupalak@hotmail.com

Cases Report

Case 1

The patient was a full term infant girl, born by caesarian section due to thick meconium stain amniotic fluid with a birth weight of 3180 grams. Her Apgar scores were 5 and 7 at 1 and 5 minutes. She developed respiratory distress with meconium aspiration syndrome and left pneumothorax requiring 4 days of ventilatory support. On the 7th day of life, a painful subcutaneous mass measuring 5 x 5 cm was noticed at the left upper thigh and another 3 x 3 cm mass was seen at the right shoulder with some inflammation and fluctuation. Skin biopsy from the upper thigh was done and showed normal epidermis and dermis, scattered patchy areas of fat necrosis with crystallization of fat, forming needle-shaped clefts in a radial arrangement in the macrophages and lipocytes (Fig. 1, 2). Subcutaneous fat necrosis of the newborn with secondary bacterial infection was diagnosed. The patient was treated with cloxacillin and gentamicin intravenously for 7 days. Serum ionized calcium was monitored. The level was 1.21 mmol/L (normal 1.18-1.3 mmol/L) which increased

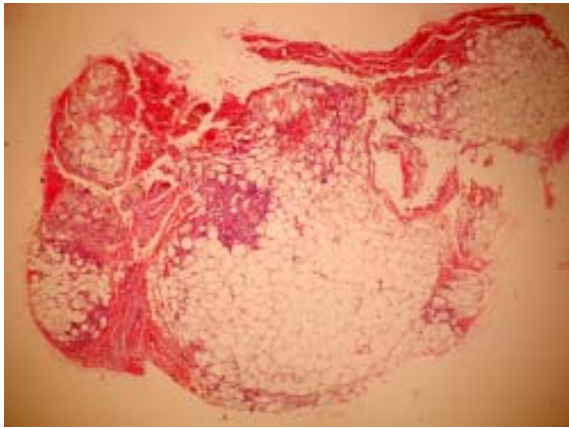


Fig. 1 Biopsy from the subcutaneous tissue showed the pathology in the subcutaneous tissue (Low power)

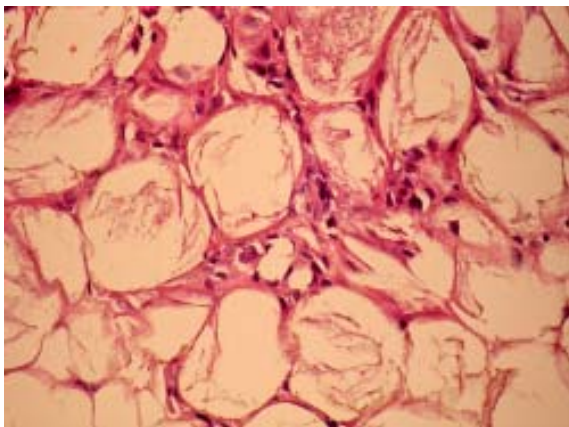


Fig. 2 A high power view showed inflammatory cells with the characteristic needle-shaped clefts

to 1.24 mmol/L on the 14th day of life. At the age of 27 days, serum calcium increased to 1.41 mmol/L with clinical symptoms of irritability. Oral prednisolone at the dose of 1 mg/kg/day was given for 2 weeks. Follow up serum calcium levels were normal after prednisolone treatment 2 weeks. The lesions resolved in 4 months without scarring.

Case 2

The patient was a full term infant boy, born by emergency cesarean section due to fetal distress with a birth weight of 3640 grams. His Apgar scores were 1 and 1 at 1 and 5 minutes. Cardiopulmonary resuscitation was performed for 10 minutes. The infant developed respiratory distress requiring ventilatory

support for 2 days. Ampicillin and cefotaxime were given for 18 days due to clinical sepsis. On the 20th day of life, multiple painless firm subcutaneous plaques were noticed on the left arm. A clinical diagnosis of subcutaneous fat necrosis was made. Skin biopsy from the left arm revealed lobular panniculitis with needle-shaped cleft in fat cells. His serum calcium levels were slightly elevated at 1.41 mmol/L (normal 1.18-1.30 mMol/L). Serum phosphate, BUN, creatinine, parathyroid hormone, urine calcium/creatinine, and film of the long bone were normal. The infant developed signs of irritability and poor feeding so he was treated with oral prednisolone at the dose of 1mg/kg/day for 2 weeks and weaned off in 3 months. The infant was kept in the hospital for 6 weeks. His serum calcium was closely monitored and was unremarkable when he was 3 months old. The lesions resolved without scarring at age 5 months but he developed spastic cerebral palsy due to severe perinatal asphyxia.

Case 3

The third patient was a full term infant boy, born by cesarean section due to primibreech presentation with a birth weight of 3335 grams. His Apgar scores were 8 and 10 at 1 and 5 minutes. During the perinatal period, he developed hypoglycemia and hyperbilirubinemia. On the third day of life, a single, non-tender, firm 3x5 cm subcutaneous nodule was noticed at the upper back. His serum calcium was slightly elevated at 1.34 mmol/L (normal 1.18-1.30 mmol/L). His mother refused a skin biopsy. Serial serum calcium levels were monitored and were within normal limits. He was closely observed without prednisolone treatment. At the age of 1 month, the lesion disappeared completely without any skin atrophy.

Case 4

The fourth patient was an infant girl with Down's syndrome, born via caesarean section due to previous caesarian section, from a hepatitis B antigen positive mother, with a birth weight of 3790 grams. Her Apgar scores were 5 and 6 at 1 and 5 minutes. The infant developed respiratory distress requiring ventilatory support for 3 days. During the perinatal period, she developed transient hypoglycemia, dyspnea and tachypnea. Cardiac examination showed systolic murmur grade II at left lower parasternal border. Echocardiogram showed atrium septal defect secundum. She was also diagnosed with congenital hypothyroidism and was treated with eltroxin. The infant was discharged home after 1 month of hospitalization. On the 42nd day

of life, the infant developed two non-tender, firm subcutaneous nodules with diameter of 1x1 cm and 2 x 2 cm at the left shoulder. A clinical diagnosis of subcutaneous fat necrosis was made. The baby's mother refused a skin biopsy. Serum ionized calcium was monitored and revealed 1.33 mmol/L (normal 1.18-1.30 mmol/L). Serum phosphate level was normal. The infant was closely monitored for serial serum calcium and revealed normal levels. The baby was closely observed because she had no signs and symptoms of hypercalcemia. At the age of 4 months, the subcutaneous nodules decreased in size and had completely disappeared at the age of 7 months without specific treatment.

Case 5

The fifth patient was a 22-day-old term boy, born by cesarean section due to fetal distress at a private hospital, with a birth weight of 3,330 grams. His Apgar scores were 1, and 1 at 1 and 5 minutes. The patient was intubated at birth because of bradycardia and poor respiratory effort. He was diagnosed with severe birth asphyxia with sepsis and he was treated with intravenous cefotaxime and amikacin. On the fifth day of life, multiple subcutaneous plaques were observed on his back and left arm. The baby was discharged from the hospital on the 18th day of life without treatment. When he was 22 days old, his mother brought him to Queen Sirikit National Institute of Child Health for evaluation of his skin lesions. Physical examination revealed multiple violaceous, firm, well-circumscribed, subcutaneous plaques involving left upper arm and upper back. His ionized serum calcium level was 1.44 mmol/L (normal 1.18-1.30 mmol/L). Histopathology from the subcutaneous plaques showed focal lobular panniculitis with needle-shaped cleft in fat cells. Treatment was observation for signs and symptoms of hypercalcemia and the skin lesions resolved in 2 months without specific treatment.

Case 6

The sixth patient was a full term infant boy, born by forcep extraction due to thick meconium stain amniotic fluid and fetal distress. His Apgar scores were 3 and 7 at 1 and 5 minutes. He developed mild meconium aspiration syndrome and required oxygen therapy. On the 4th day of life, a subcutaneous mass diameter 0.5x3.5 cm was noticed on the left neck. Serum ionized calcium was 1.41 mmol/L (normal 1.18-1.30 mmol/L) but the patient had no signs and symptoms of hypercalcemia. At age 1 month, the skin lesion disappeared without specific treatment.

Case 7

The seventh patient was a full term infant girl, born by caesarian section due to large omphalocele and fetal distress with a birth weight of 2900 grams. Her Apgar scores were 1 and 3 at 1 and 5 minutes. On the 5th day of life, large subcutaneous plaques were noticed on her back and both buttocks. Her serum ionized calcium was 1.77 mmol/L (normal 1.18-1.30 mmol/L). Prednisolone at the dose of 1 mg/kg/day was given for 2 weeks due to signs of irritability and serum ionized calcium was normal after two weeks of treatment. The lesions were resolved in 1 month.

The details of clinical manifestations and treatments of the presented cases are summarized in Table 1.

Discussion

Subcutaneous fat necrosis of the newborn was first described by Cruise in 1875 and initially was called scleroderma of the newborn infant⁽¹³⁾. It is an uncommon transient condition seen in term to post term neonates who experience perinatal complications in the first few weeks of life.

The etiology for SCFN is unknown, but may be initiated by ischemic injury, hypoxia and hypothermia⁽¹⁻⁶⁾. Perinatal asphyxia or difficulty at labor may be associated with SCFN. The most frequently recognized possible etiologic factors in this series was birth asphyxia in 5 of 7 cases (70%) and meconium aspiration syndrome in 2 of 7 cases (28%).

The main clinical differential diagnosis of SCFN is sclerema neonatorum (SN). These two entities may be distinguished from each other based on history and physical examination⁽¹⁴⁾. When the clinical diagnosis is not typical, the skin biopsy is helpful. Skin biopsy of SCFN demonstrated necrosis of fat, abundant histiocytes, multinucleated giant cells with granuloma formation and lipocytes with characteristic radically arranged needle shaped clefts in comparisons with SN that showed adipocytes with scattered small clefts and in older lesions with thickened fibrotic septate and calcifications⁽¹⁴⁾. In the present study, the authors did skin biopsies in three cases and were compatible with subcutaneous fat necrosis.

Subcutaneous fat necrosis of the newborn generally follows an uncomplicated course with spontaneous resolution over several weeks to several months^(15,16). The treatment was aimed at prevention and management of complications. Some lesions become calcified or fluctuant with liquefied fat. Mild atrophy of the skin may be noticed after resolution⁽¹⁰⁾.

Table 1. Demographic data of SCFN of the term newborn

Patient	Sex	Onset (days)	Type of delivery	APGAR score	Perinatal condition	Location	Skin biopsy	Serum ionized calcium (normal = 1.18-1.3 mmol/L)	Treatment	Age of resolution (months)
1	F	7	C/S due thick to meconium syndrome	5,7	- Pneumothorax - Meconium aspiration	Shoulder, upper thigh	Patchy areas of fat necrosis with needle-shaped clefts	1.41	Prednisolone Antibiotics	4
2	M	20	C/S due to fetal distress	1,1	- Respiratory distress - Sepsis	Arm	Panniculitis and needle-shaped cleft	1.41	Prednisolone	5
3	M	3	C/S due to primi breech	8,10	- Hypoglycemia - Hyperbilirubinemia	Upper back	ND	1.34	Observe	1
4	F	42	C/S due to previous C/S	5,6	- Down's syndrome - Hypoglycemia - Hypothyroidism	Shoulder	ND	1.33	Observe	4
5	M	22	C/S due to fetal fetal distress	1,1	- Respiratory - Sepsis	Upper arm, back	Panniculitis and needle-shaped cleft	1.44	Observe	2
6	M	4	F/E due to thick meconium and fetal distress	3,7	- Mild meconium aspiration syndrome	Neck	ND	1.41	Observe	1
7	F	5	C/S due to fetal distress	1,3	- Rupture omphalocele - Sepsis	Back, buttock	ND	1.77	Prednisolone	1

C/S = caesarian section, F/E = forceps extraction, ND = not done

The most important complication of SCFN, which all the patients should be regularly monitored for, is hypercalcemia. Other complications are thrombocytopenia, hypoglycemia, and hypertriglyceridemia^(10,16,17).

Hypercalcemia usually occurs between 2 to 16 weeks, most commonly at 6-8 weeks⁽¹⁷⁻²²⁾. The hypercalcemia is often mild and asymptomatic but can be symptomatic. Clinically, the most common feature of hypercalcemia is failure to thrive, vomiting, feeding difficulties, irritability, hypotonia, and constipation. Seizures, cardiac arrest, and renal failure are serious sequelae of prolonged hypercalcemia. Mortality rate from untreated hypercalcemia complicating SCFN has been estimated at 15%⁽¹⁹⁾.

The pathogenesis of hypercalcemia following SCFN is not well understood. Suggested mechanisms include elevated prostaglandin E and elevated parathyroid hormone levels^(21,23). Other proposed the elevated 1, 25 (OH)₂D₃ from the fat tissue stimulates intestinal calcium uptake^(24,25).

Management of hypercalcemia in SCFN depends on the clinical and level of serum ionized calcium. If the patient has symptoms of hypercalcemia such as lethargy or irritability, aggressive management is indicated. Treatment of SCFN with hypercalcemia may include adequate hydration, vitamin D restriction, a low calcium diet, and a calcium wasting diuretic such as furosemide⁽²⁶⁻²⁸⁾. Oral prednisone effectively lowers serum calcium levels by interfering with metabolism of vitamin D to the active form 1, 25-dihydroxyvitamin D. Prednisone may also inhibit production of this metabolite by macrophages involved in the granulomatous inflammatory process. Etidronate, which is a member of the bisphosphonate group, is known to decrease bone resorption. It has been reported to be successful in controlling severe hypercalcemia in cases of resistant SCFN⁽²⁸⁾.

In the present study, all cases were closely monitored for hypercalcemia and five cases (70%) developed hypercalcemia. Three cases (case 1, 2, and 7) developed symptoms of hypercalcemia such as irritability and were treated with oral prednisolone. Serum calcium returned to normal after treatment ranged from 2 weeks to 3 months. Another two cases with hypercalcemia (case 5 and case 6) were asymptomatic so treatment is only observation.

In summary, the indurated skin lesions and clinical course of the presented patients were typical of SCFN with compatible skin biopsy in three cases. Hypercalcemia developed in five cases (70%). All sub-

cutaneous lesions resolved without sequelae.

References

1. Chen TH, Shewmake SW, Hansen DD, Lacey HL. Subcutaneous fat necrosis of the newborn. A case report. *Arch Dermatol* 1981; 117: 36-7.
2. Glover MT, Catterall MD, Atherton DJ. Subcutaneous fat necrosis in two infants after hypothermic cardiac surgery. *Pediatr Dermatol* 1991; 8: 210-2.
3. Chuang SD, Chiu HC, Chang CC. Subcutaneous fat necrosis of the newborn complicating hypothermic cardiac surgery. *Br J Dermatol* 1995; 132: 805-10.
4. Wiadrowski TP, Marshman G. Subcutaneous fat necrosis of the newborn following hypothermia and complicated by pain and hypercalcaemia. *Australas J Dermatol* 2001; 42: 207-10.
5. Silverman AK, Michels EH, Rasmussen JE. Subcutaneous fat necrosis in an infant, occurring after hypothermic cardiac surgery. Case report and analysis of etiologic factors. *J Am Acad Dermatol* 1986; 15(2 Pt 2): 331-6.
6. Katz DA, Huerter C, Bogard P, Braddock SW. Subcutaneous fat necrosis of the newborn. *Arch Dermatol* 1984; 120: 1517-8.
7. Cunningham K, Paes BA. Subcutaneous fat necrosis of the newborn with hypercalcemia: a review. *Neonatal Netw* 1991; 10: 7-14.
8. Fenniche S, Daoud L, Benmously R, Ben Ammar F, Khelifa I, Chaabane S, et al. Subcutaneous fat necrosis: report of two cases. *Dermatol Online J* 2004; 10: 12.
9. Kaya Z, Ergenekon E, Erol I, Poyraz A, Koc E, Atalay Y. Subcutaneous fat necrosis. *Indian J Pediatr* 2004; 71: 1041.
10. Burden AD, Krafchik BR. Subcutaneous fat necrosis of the newborn: a review of 11 cases. *Pediatr Dermatol* 1999; 16: 384-7.
11. Caple JJ, Reyes S. Subcutaneous fat necrosis of the newborn: a case presentation. *J Perinatol* 1996; 16: 140-1.
12. Klaiudom C. Subcutaneous fat necrosis of the newborn (SCFN): a case report. *Nopparat Rajathanee Hosp Med J* 1999; 10: 56-60.
13. Crus P. Ein fall von sclerodermie (sogenannt sclerodermis adulotorum bei saighing. St Peterburg) *Zeitichrify* 1875; 5: 306.
14. Fretzin DF, Arias AM. Sclerema neonatorum and subcutaneous fat necrosis of the newborn. *Pediatr Dermatol* 1987; 4: 112-22.

15. Anderson DR, Narla LD, Dunn NL. Subcutaneous fat necrosis of the newborn. *Pediatr Radiol* 1999; 29: 794-6.
16. Tran JT, Sheth AP. Complications of subcutaneous fat necrosis of the newborn: a case report and review of the literature. *Pediatr Dermatol* 2003; 20: 257-61.
17. Lewis A, Cowen P, Rodda C, Dyall-Smith D. Subcutaneous fat necrosis of the newborn complicated by hypercalcaemia and thrombocytopenia. *Australas J Dermatol* 1992; 33: 141-4.
18. Hicks MJ, Levy ML, Alexander J, Flaitz CM. Subcutaneous fat necrosis of the newborn and hypercalcemia: case report and review of the literature. *Pediatr Dermatol* 1993; 10: 271-6.
19. Norwood-Galloway A, Lebwohl M, Phelps RG, Raucher H. Subcutaneous fat necrosis of the newborn with hypercalcemia. *J Am Acad Dermatol* 1987; 16(2 Pt 2): 435-9.
20. Puzenat E, Aubin F, Zyka F, Fromentin C, Humbert P. Subcutaneous fat necrosis of the newborn with hypercalcemia. *Ann Dermatol Venereol* 2000; 127: 1087-9.
21. Thomsen RJ. Subcutaneous fat necrosis of the newborn and idiopathic hypercalcemia. Report of a case. *Arch Dermatol* 1980; 116: 1155-8.
22. Liu FT, Dobry MM, Shames BS, Goltz RW. Subcutaneous nodules and hypercalcemia in an infant. *Subcutaneous fat necrosis of the newborn. Arch Dermatol* 1993; 129: 898-2.
23. Sharata H, Postellon DC, Hashimoto K. Subcutaneous fat necrosis, hypercalcemia, and prostaglandin E. *Pediatr Dermatol* 1995; 12: 43-7.
24. Finne PH, Sanderud J, Aksnes L, Bratlid D, Aarskog D. Hypercalcemia with increased and unregulated 1,25-dihydroxyvitamin D production in a neonate with subcutaneous fat necrosis. *J Pediatr* 1988; 112: 792-4.
24. Metz SA, Hassal E. PGE, hypercalcemia, and subcutaneous fat necrosis. *J Pediatr* 1980; 97: 336.
25. Kruse K, Irle U, Uhlig R. Elevated 1,25-dihydroxyvitamin D serum concentrations in infants with subcutaneous fat necrosis. *J Pediatr* 1993; 122: 460-3.
26. Dudink J, Walther FJ, Beekman RP. Subcutaneous fat necrosis of the newborn: hypercalcaemia with hepatic and atrial myocardial calcification. *Arch Dis Child Fetal Neonatal Ed* 2003; 88: F343-5.
27. Ghirri P, Bottone U, Coccoli L, Bernardini M, Vuerich M, Cuttano A, et al. Symptomatic hypercalcemia in the first months of life: calcium-regulating hormones and treatment. *J Endocrinol Invest* 1999; 22: 349-53.
28. Rice AM, Rivkees SA. Etidronate therapy for hypercalcemia in subcutaneous fat necrosis of the newborn. *J Pediatr* 1999; 134: 349-51.

การตายของไขมันใต้ผิวหนังในทารกแรกเกิด

ศรียุทธลักษณะ สิงคาลวณิช, วณิดา ลิ้มพวงศานุรักษ์, จูฑิตาภรณ์ วรรณประเสริฐ

การตายของไขมันใต้ผิวหนังในทารกแรกเกิด พบได้ไม่บ่อย มักพบในทารกแรกเกิดคลอดครบกำหนด ที่มีปัญหาาระหว่างคลอด ผู้รายงานได้รายงานทารกแรกเกิดที่มีการตายของไขมันใต้ผิวหนังจำนวน 7 ราย ที่มารับการรักษาที่สถาบันสุขภาพเด็กแห่งชาติมหาราชินี ตั้งแต่ปี พ.ศ. 2545 - พ.ศ.2548

ผลการศึกษา: ทุกรายเป็นทารกคลอดครบกำหนด เพศชาย 4 ราย เพศหญิง 3 ราย อายุที่มีอาการทางผิวหนังตั้งแต่ 3 วันถึง 42 วัน (เฉลี่ย 14 วัน) ตำแหน่งที่พบบ่อย ได้แก่ หลัง 3 ราย ไหล่ 2 ราย แขน 2 ราย ก้น 1 ราย คอ 1 ราย พบว่าปัจจัยเสี่ยงในการเกิดการตายของไขมันใต้ผิวหนัง ได้แก่ ภาวะหายใจลำบากระหว่างคลอด 5 ราย (ร้อยละ 70) ได้ทำการตัดชิ้นเนื้อเพื่อตรวจทางพยาธิวิทยา 3 ราย ผลการตรวจทุกรายเข้าได้กับการตายของไขมันใต้ผิวหนัง การรักษาเป็นการรักษาตามอาการและเฝ้าระวังภาวะแคลเซียมสูงในเลือด การศึกษานี้พบแคลเซียมสูงในเลือด 5 ราย (ร้อยละ 70) ซึ่งต้องให้ยาเฟร็ดนิโซโลนกิน 3 ราย ทุกรายอาการทางผิวหนังหายเป็นปกติ

สรุป: ทารกแรกเกิดทุกรายที่มีการตายของไขมันใต้ผิวหนัง ควรตรวจหาระดับแคลเซียมในเลือดเป็นระยะเพื่อเฝ้าระวังภาวะแคลเซียมสูงในเลือดได้แก่ อาเจียน ร้องกวน เลี้ยงไม่ได้
