Lipoma Due to Chronic Intermittent Compression as an Occupational Disease

Yusuf Kenan Coban, MD, Murat Uzel, MD, and Nazim Gumus, MD

Abstract: A total of 15 coppersmiths who do the job as a traditional profession in Kahramanmaras Province were retrospectively analyzed for revealing a possible relationship of lipoma formation and chronic compression, as the work characteristic related to mechanical pressure to the right thoracal and shoulder region. The workers were examined and their historical data were noted. Chronic compression sites in the patients were also evaluated by magnetic resonance imaging and ultrasonography. The ages were between 30 and 52 years. Body mass index ranged from 18.6 to 38.8. Five were operated for visible lipomatous masses at their injured sites. All of the specimens were reported as containing mature adipocytes. An increased subcutaneous fat thickness at the injured sides of the patients was seen when compared with the uninjured contralateral sides using ultrasonography. At the magnetic resonance images, no capsule intensity was observed in the lipomatose masses. Subcutaneous fat of injured right mammarial regions was thicker than the other contralateral sides in all of the cases. The most prominent lipomas were seen in obese workers, and strong evidence for chronic trauma and lipoma formation as an occupational disease was obtained from the study.

Key Words: posttraumatic lipoma, chronic intermittent compression, occupational disease

(*Ann Plast Surg* 2006;57: 275–278)

Lipomas are benign tumors composed of mature fat cells. Most solitary lipomas are superficial and small. Solitary lipomas may develop with weight gain but usually do not shrink after weight loss. These lesions can occur after both acute and chronic trauma. Trauma as a mechanism for lipoma formation remains a controversial topic. In recent years, acute trauma has been also related to the formation of a lipoma by several authors.[1–9] Latency period was reported as 2 to 12 months following an acute blunt trauma to the lower lumbar, gluteal, and trochanteric regions.[8] This has been regarded as related to the typical distribution of female fat and on the particular anatomy of the subcutaneous fascial structures in buttock and thigh. Chronic trauma was firstly postulated as a cause of lipomas in French wine porters.[10] The literature contains case reports of lipomas forming after a hematoma resolves in an area of soft tissue trauma.[1–5,11] The first posttraumatic lipoma in site of chronic trauma was reported by Brenner.[11] Acute or chronic trauma as an etiologic factor in posttraumatic lipoma formation is a well-known clinical entity. The following series illustrates how prolonged pressure may be responsible for the formation of some apparent lipomas.

Received March 6, 2006 and accepted for publication March 16, 2006.
From the Sutcuimam University School of Medicine, Kahramanmaras, Turkey.
Reprints: Yusuf Kenan Coban, MD, Hastaneler caddesi, Tip Fakültesi Dekanligi, 46050 Kahramanmaras, Turkey. E-mail: cobanyk@ksu.edu.tr.

ISSN: 0148-7043/06/5703-0275
DOI: 10.1097/01.sap.0000223205.88824.39

MATERIALS AND METHODS

A total of 15 males who were coppersmiths working in Kahramanmaras Province were retrospectively examined. Some of them (5 of the patients) were operated for subcutaneous prominent right thoracal masses. Their weight, height, and medical histories were recorded. Body mass indexes (BMI) were calculated for each patient. All of the masses and chronic compression–induced changes in the injured areas were evaluated by magnetic resonance imaging (MRI) and ultrasonographic examination. All the specimens which were taken from the operated patients were sent to pathologic examination. Additionally, their data related to the working conditions and how long they worked were recorded (Table 1). The conditions of working were seen at the offices of the coppersmiths, and the working characteristics were photographed and noted. Their past medical history and their cigarette smoking usage and other habits (use of smokeless tobacco or Maras powder) were also noted. The subcutaneous masses and soft tissue changes over right mammarial regions of the patients were clinically scored as follows:

Score 0, no asymmetry.

Score 1, minimal asymmetry but no visible subcutaneous mass.

Score 3, visible subcutaneous mass at minimal size (not requiring surgical intervention).

Score 4, subcutaneous masses at moderate size (the decision depends on the patient, ie, the surgery can be made or not).

Score 5, huge subcutaneous mass (an obvious deformity necessitating surgery).

Characteristics of the Occupation

The work has been a traditional profession in South Anatolia for 50–60 years. The main objective is to shape the copper frames using a special machine. The worker's task is

TABLE 1. The Patients' Demographics

Patient	Age (years)	Cigarette Smoking	Maraspowder/Smokeless Tobacco	Clinical Score	Duration of Work (years)	BMI
M.B.	51	−	+ (30 years)	5	35	29.3
O.B.	49	+ (for 36 years)	+ (20 years)	4	36	38.8
M.C.	32	−	+ (15 years)	2	38	18.7
O.Z.	31	+ (for 13 years)	−	3	20	27.6
M.Ç.	46	−	−	2	21	20.1
Y.K.	38	+ (for 8 years)	−	1	22	19.1
B.F.	39	−	+ (22 years)	1	20	18.6
A.K.	33	+ (for 9 years)		1	14	21.2
V.B.	43	+ (for 3 years)	+ (11 years)	1	29	23.1
S.A.	44	−	−	1	26	24.6
M.Ö.	38	−	−	2	22	25.6
L.U.	32	−	−	3	11	26.9
H.K.	45	−	+ (11 years)	3	26	27.5
B.G.	35	+ (for 7 years)	−	2	16	23.3

to hold the edges of frames fixed while the machine turns it. A professional holds the edge of copper frame with 2 objects. The first object is a long metal rod with a blunt distal edge and the other one is short wood with a notched distal edge. A professional expends a very great effort for shaping while the copper frame is spinning. According to the patients' view, it becomes generally a necessity to compress the proemial end of the long metal rod by a forced adduction of the shoulder (Fig. 1). The machine is designed for right-handed persons, so all the coppersmiths hold the long metal rod with their right hand and the wood is held by the left hand. The working time for a day is usually 6–8 hours, and all of the patients usually had worked 6 days a week during their active work life. The following cases are samples from the study group.

Case 1 (M.B.)

A 45-year-old male presented with a very big mass over the right mammarial site (Fig. 2A). Physical examination showed that the mass extended to the right flank, right axillary, and posterior thoracal regions (20 × 25 × 5 cm in diameter). A slowly growing mass was on the overlying skin. There was no tenderness or inflammation over the skin of the solid mass. The mass was evaluated by ultrasonography and MRI (Fig. 2B). Under general anesthesia, the central part of the mass was removed through inframammarial incision with some crescent skin (Fig. 2C). Then, a liposuction was performed on the remaining mass (Fig. 2D), and skin closure was done after hemostasis. A Hemovac drain was used to evacuate the dead space for 2 days. The solid mass was reported as containing mature adipose tissue.

FIGURE 1. Typical compression in regions of right inner arm, right anterior thoracal wall, and shoulder from working.

Case 2 (M.Ç.)

A 49-year-old male also presented with subcutaneous masses at the right thoracal and right medial arm regions (Fig. 3).

Case 3 (O.B.)

This case was a 46-year-old male who is an active worker. He was examined simply as a part of the study. His BMI was normal, and his clinical score was 2. So no surgical correction was done. Some bruising overlying the skin was present, as he had worked recently (Fig. 4).

RESULTS

The ages ranged between 30 and 52 years. The BMI range of the group was between 18.6 and 38.8. All MRI examination characteristics showed isotension relative to subcutaneous fat masses without surrounding capsule formation at T1- and T2-weighted images. No low-signal-intensity capsule was seen separating the lipoma surrounding tissues at MR images. Subcutaneous fat thickness was evaluated ultrasonographically and ranged between 1 and 6 cm. When compared with the contralateral side of each patient, all the injured areas showed much subcutaneous fat thickness. Eight (53%) of the patients had smoking habits. Six (40%) of the patient used smokeless tobacco. One patient had hypertension which needed medication for 5 years. In the remainder of the group, no systemic disease was present. Five of the patients needed surgi-

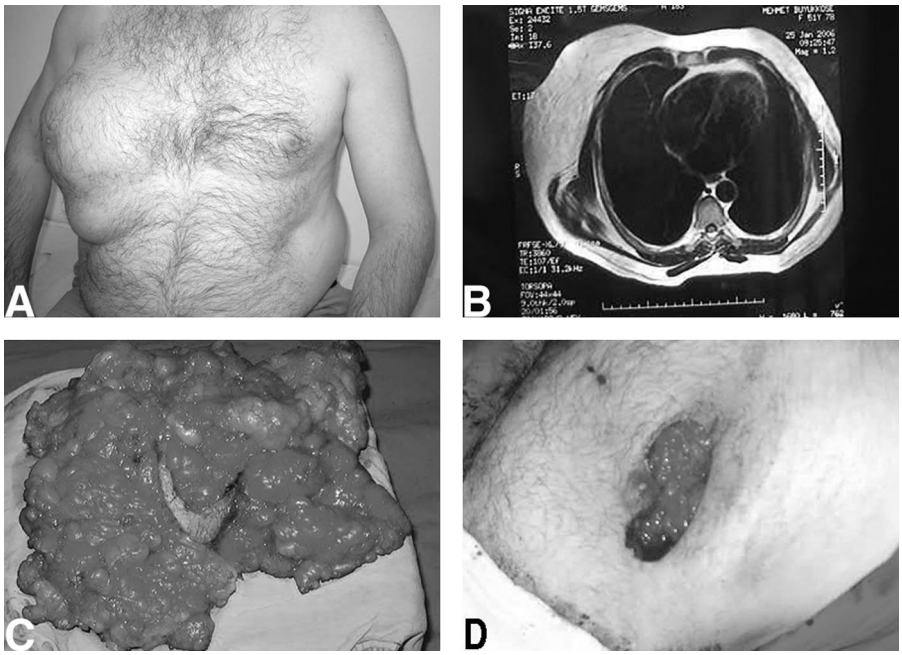

FIGURE 2. A, Case 1. B, Axial T1-weighted MR image of case 1. C, Typical nonencapsulated lipoma surgically excised with overlying crescent skin. D, After the central excision of the lipoma, minimal fat tissue over the pectoral fascia was left at the base of the surgical area.

FIGURE 3. Another obese worker. Marked lipoma at the right thoracal and upper abdominal region is seen. Note that a lipomatous mass is also seen at the inner side of the right arm.

FIGURE 4. A nonobese worker with clinical score 1.

cal intervention for visibile subcutaneous lipomatous masses (scores 4–5).

DISCUSSION

Lipomas are the most common benign mesenchymal tumors and usually occur under the skin but have also been found in deeper tissues and even in various body organs, such as the heart, brain, and lung, laryngeal space, omentum, skeletal muscle, thyroid, small bowel, joint, endobronchium, and oral cavity.[12–19] A localized mass of fat in some patients undoubtedly represents a true neoplasm, whereas in others it may be simply a prolapse of normal fat through a deficiency in the enveloping fascia. Trauma is one of the most implicated etiological factors in lipoma formation, although its pathogenesis is not known.[20] Fat tissue's susceptibility to ischemia and trauma is a well-known clinical entity, even after routine noninvasive interventions.[21] A cause/effect hypothesis can be considered in posttraumatic lipoma formation, if it meets the postulates as laid down by Segond[22] (authenticity of trauma, severity of trauma, integrity of the area before trauma, type of tumors related to the site of trauma, reasonable latent period) and Warren[23] (prior integrity of the tumor site, injury severe enough to initiate reparative proliferation of cells, reasonable latent period, tumor compatible with scar tissue, and with the anatomic location of the injury).

All of the pathologic reports of surgically treated cases in the group were nonencapsulated lipomas containing mature adipocytes. BMI indexes and the sizes of the lipomatous masses correlated well because the soft tissue scores 4–5 were seen in obese patients. There was no relationship between the duration of work and the sizes of lipomatous masses. Also, age, smoking habits, and other parameters evaluated did not correlate with the scores. In all the cases described, the wounded part was previously tumor free, the authenticity and severity of trauma were confirmed by occupational history, the tumor originated within the boundary of the injury, and the latency period was proper, considering that the visible masses were noted between 1 and 5 years after the onset of chronic trauma. The abovementioned criteria are met for lipoma growth in the cases. Furthermore, the absence of a deep adipose compartment in the areas of injury of some of the patients presented and the history of slow constant growth of all the lesions strengthen our belief that fascial injuries and fat herniation were not always implied as pathogenetic mechanisms in this series. The particular features of the cases strongly oppose the pathogenetic mechanisms so far reported; the progressive growth of the lesions does not support the "fat herniation" theory.[1] The most striking difference of these lipomas from previously reported ones is the presence of a history of chronic repeated trauma as an occupational disease. Concomitant presence of the right thoracal lipoma with the lipoma of the inner side of the right arm in case 2 presented another a very strong evidence for a pathogenetic role of chronic trauma in lipomatogenesis. The precise pathogenesis is still unknown; however, it is reasonable to suppose that local inflammation may induce adipocyte proliferation such as in lipoma arborescens.[24] Copcu and Sivrioglu[25] examined 10 patients with 12 lipomas in neck, lower extremity, and trunk regions after blunt trauma and speculated only traumas serve as a cause of fat necrosis that may trigger the formation of the lipoma. Taking into account the 2 views that adults have a fixed complement of adipocytes and the increase in the volume of adipose tissue in cases of obesity results from differentiation of primitive reticular cells into fat cells, we can conclude that local inflammatory mediators induced by mechanical trauma accelerate differentiation of mesenchymal precursors (preadipocytes) in mature adipocytes.[26,27] This observational study showed a close relationship between chronic intermittent compression and lipoma formation. It also suggested that lipomatous masses could be more prominent in obese patients who were subjected to chronic mechanical pressure.

REFERENCES

1. Brooke RI, MacGregor AJ. Traumatic pseudolipoma of the buccal mucosa. *Oral Surg Oral Med Oral Pathol*. 1969;28:223.
2. Meggitt BF, Wilson JN. The battered buttock syndrome: fat fractures. *Br J Surg*. 1972;59:165.
3. Herbert DC, DeGeus J. Post-traumatic lipomas of the abdominal wall. *Br J Plast Surg*. 1975;28:303.
4. Rozner I, Isaacs GW. The traumatic pseudolipoma. *Aust N Z J Surg*. 1977;47:779.
5. Penoff JH. Traumatic lipomas/pseudolipomas. *J Trauma*. 1982;22:63.
6. Dodenhoff TT. Trauma induced saddle bag: case report. *Lipoplasty Newsl*. 1988;5:55.
7. Elsahy NI. Posttraumatic fatty deformities. *Eur J Plast Surg*. 1989;12: 208.
8. Cormenzana Olaso PS, Martinez Florez AE, Cecilia Gomez JA. Lipodistrofia post-traumatica. *Cir Plast Iberolatinoamer*. 1992;18:47.
9. David LR, De Franzo A, Marks M, et al. Posttraumatic pseudolipoma. *J Trauma*. 1996;40:396.
10. Cairns RJ. The subcutaneous fat. In: Rook A, Wilkinson DS, Ebling FJA, eds. *Textbook of Dermatology*. Oxford, UK: Blackwell; 1972:1510.
11. Brenner S. Lipoma on the shoulder in site of chronic trauma. *Arch Dermatol*. 1983;1:450.
12. Rimmer J, Singh A, Irving C, et al. Asymptomatic oropharyngeal lipoma complicating intubation. *J Laryngeal Otol*. 2005;119:483–485.
13. Beettie GC, Irwin ST. Torsion of an omental lipoma presenting as an emergency. *Int J Clin Proc Suppl*. 2005;147:130–131.
14. Gutkmeth DR. Painful intramuscular lipoma of the thigh. *South Med J*. 2004;97:1121–1122.
15. Leima SF, Navacha D, Nigro N, et al. Lipoma of the thyroid? *J Pediatr Endocrinol Metab*. 2004;17:1013–1015.
16. Cherian A, Singh SJ, Broderich N, et al. Small bowel volvulus due to giant mesenteric lipoma. *Pediatric Surg*. 2004;20:869–871.
17. Keser S, Bayar A, Numanoğlu G. An unusual cause for anterior knee pain: intraarticular lipoma. *Knee Surg Sports Traumatol Arthrosc*. 2005; 13:585–588.
18. Celik G, Kaya A, Ozdemir O, et al. Endobronchial lipoma: a case report. *Tuberk Toraks*. 2003;51:432–435.
19. Del Castilla Pards de Vera JL, Gomez Garcia E. Chronic lingual ulceration caused by lipoma of the oral cavity: case report. *Med Oral*. 2004;91:166–167.
20. Copcu E. Sport-induced lipoma. *Int J Sports Med*. 2004;25:182–185.
21. Tamvakopoulos GS, Toms AP, Glasgow M. Subcutaneous thigh fat necrosis as a result of tourniquet control during total knee arthroplasty. *Ann R Coll Surg Engl*. 2005;87:396.
22. Segond MP. Cancer and occupational trauma. *Ass Franc Chir Proc Verb*. 1907;20:745.
23. Warren S. Minimal criteria required to prove causation of traumatic or occupational neoplasms. *Ann Surg*. 1943;117:585.
24. Armstrong SJ, Watt I. Lipoma arborescens of the knee. *Br J Radiol*. 1989;62:178.
25. Copcu E, Sivrioglu NS. Posttraumatic lipoma: analysis of 10 cases and explanation of possible mechanisms. *Dermatol Surg*. 2003;29:215–220.
26. Hirsch J, Knittle JL. Cellularity of obese and nonobese human adipose tissue. *Fed Proc*. 1970;29:1516.
27. Smahel J. Adipose tissue in plastic surgery. *Ann Plast Surg*. 1986;16: 444.