Fistulization of rheumatoid joints

Spectrum of identifiable syndromes

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Shapiro, R. F., Resnick, D., Castles, J. J., D'Ambrosia, R., Lipscomb, P. R., and Niwayama, G. (1975). *Annals of the Rheumatic Diseases*, 34, 489–498. **Fistulization of rheumatoid joints. Spectrum of identifiable syndromes. Eight patients with rheumatoid arthritis developed cutaneous fistulae adjacent to affected joints. Rheumatoid factor was positive in eight patients; subcutaneous nodules were noted in seven. Two patients had features of rheumatoid vasculitis. A spectrum of syndromes characterized by cutaneous fistulae was observed. Three patients showed classical fistulous rheumatism. Four patients developed septic arthritis which subsequently fistulized; in two, infection was associated with total joint replacement. One patient showed a cutaneous sinus accompanying a large calf cyst. A variety of diagnoses must be considered when cutaneous fistulae appear near joints in patients with rheumatoid arthritis.**

Cutaneous joint fistulae are rarely recognized as a feature of rheumatoid arthritis (RA) (Bywaters, 1953). This report describes eight rheumatoid patients who showed such fistulae. Clinical, radiographic, and pathological features are presented which suggest that a spectrum of identifiable syndromes, each characterized by cutaneous sinuses developing near joints, occurs in patients with rheumatoid arthritis.

Materials and methods

Eight patients with classical RA by the A.R.A. criteria (Ropes, Bennett, Cobb, Jacox, and Jessar, 1959), were found to have cutaneous fistulae in proximity to joints. Pertinent clinical and laboratory features of each patient are summarized in Tables I and II. Rheumatoid factor was measured by the latex fixation test (Singer and Plotz, 1956). Serum immunoglobulins (IgA, IgG, and IgM) and the third component of complement (C3) were quantitated by radial immunodiffusion (Hyland Laboratories, Los Angeles, Calif.) and total complement activity (CH₅₀) by haemolytic titration (Kent and Fife, 1963). Antinuclear antibodies were detected by an immunofluorescent technique using mouse kidney cells as the source of nuclei (Zvaifler and Martinez, 1971).

Case histories

CASE 1

A 52-year-old woman with a 14-year history of sero-positive RA characterized by subcutaneous nodules and progressive unremitting synovitis in the shoulders, metacarpophalangeal (MCP) joints, proximal interphalangeal (PIP) joints, hips, knees, and metatarsophalangeal (MTP) joints was admitted for metatarsal head resections. Nine months earlier intermittent clear drainage appeared in the space between the right 2nd and 3rd toes, at the plantar surface of the right 3rd metatarsal head, and along the medial surface of the left 1st metatarsal head. Cultures for aerobic and anaerobic bacteria and fungi were sterile. X-rays showed extensive osteoporosis, erosions, and subluxations at the MTP joints (Fig. 1A). Surgery was deferred for 8 months because of suspected infection and the patient was treated with antibiotics; despite treatment, drainage continued. At the time of admission for surgery, examination of the right foot showed severe hallux valgus deformity with overriding of the 3rd toe and subluxation of all MTP joints; draining sinuses were present at the sites described above. Similar deformity was noted on the left with a single small draining sinus at the medial side of the 1st MTP. At surgery, cultures for aerobic and anaerobic bacteria, fungi, and mycobacteria, obtained from superficial and deep regions of each meta-

Table I *Features of rheumatoid arthritis in 8 patients with cutaneous fistulae from joints*

Case no.	Sex	Age (years)	Duration (years)	ARA classification		Extra-articular features	Reciprocal of serum rheumatoid factor titre
				Diagnostic	Functional		
Classical fistulous rheumatism							
1	F	52	14	Classical	II	N	640
2	M	58	28	Classical	III	N, PI, WL, L, MM, KS	10240
3	M	59	20	Classical	IV	N, KS, S, SN	640
Spontaneous fistulization of septic joints							
4	M	43	22	Classical	II	N, CP	1280
5	M	46	7	Classical	IV	N, PI, MM, CV, KS	640
6	F	62	24	Classical	IV	N	640
7	F	70	20	Classical	III	None	256
Miscellaneous							
8	F	52	7	Classical	II	N	NA

N = nodules; PI = periungual infarcts; WL = weight loss; MM = mononeuritis multiplex; KS = keratoconjunctivitis sicca; L = lymphadenopathy; CV = cutaneous vasculitis; CP = cardiopulmonary; S = splenomegaly; SN = sensory neuropathy; NA = not ascertained.

Table II *Clinical and laboratory features in 8 patients with cutaneous fistulae from joints*

<i>Case no.</i>	<i>Affected joint</i>	<i>Pain</i>	<i>Drainage</i>	<i>Fever</i>	<i>X-ray features of affected joint</i>	<i>Cultures</i>	
						<i>Drainage</i>	<i>Joint</i>
<i>Classical fistulous rheumatism</i>							
1	MTPs	+	+	—	Cysts; erosions	Sterile	Sterile
2	MTPs	+	+	—	Cysts; erosions	Sterile	Sterile
3	MTPs	+	+	—	Cysts; erosions	Sterile	Sterile
<i>Spontaneous fistulization of septic joints</i>							
4	Hip	+	+	+	Fragmentation; collapse	Anaerobic strep <i>Bacteroides</i> sp. <i>Esch. coli</i>	Anaerobic strep <i>Bacteroides</i> sp. <i>Esch. coli</i>
5	Elbow	+	+	+	Fragmentation; destruction	<i>Staph. aureus</i>	<i>Staph. aureus</i>
6	Knee	+	+	+	TKP with effusion	<i>Staph. aureus</i> <i>Pseudomonas</i> sp.	<i>Staph. aureus</i> <i>Pseudomonas</i> sp.
7	Knee	+	+	+	Lucency about TKP	<i>Staph. aureus</i>	<i>Staph. aureus</i>
<i>Miscellaneous</i>							
8	Knee	+	+	—	Not done	Sterile	Not done

TKP = total knee prosthesis.

tarsal head, were sterile. The metatarsal heads were placed in methylmethacrylate and sectioned whole; individual sections showed extensive pannus proliferation extending superficially across the cartilage and between the cartilage and subchondral bone (Fig. 1B). Increased synovial vascularity and mononuclear cell infiltration were present, but no bone fragments were apparent. Gram's and P.A.S.

stains showed no organisms. After surgery the fistulae closed and pain disappeared.

CASE 2

A 58-year-old man with RA of 28 years' duration was admitted with a 6-month history of weight loss and persistent drainage from the right foot. Rheumatoid deformities,

FIG. 1 Classical fistulous rheumatism (Case 1). **A.** Severe hallux valgus deformity in the left foot is associated with soft tissue swelling, erosions of the first metatarsal head (closed arrow), and subluxation at the 2nd (open arrow) and 3rd MTP joints. **B.** Photomicrograph ($\times 90$) of the metatarsal head showing pannus (straight arrows) extending across and beneath the articular cartilage (curved arrow). No bone fragments are seen

B

palpable lymph nodes, periungual infarcts, subcutaneous nodules, keratoconjunctivitis sicca, and mononeuritis multiplex were evident on examination. Draining ulcers were present on the right foot between the 3rd and 4th toes, on the dorsum overlying the 3rd metatarsal head, and on the lateral and plantar surfaces near the 5th and 3rd MTP joints, respectively. Bacterial cultures of the drainage were sterile. Extensive MTP joint destruction was apparent on X-rays of the right foot. Laboratory investigations showed white blood cell count $11.0 \times 10^9/l$; Westergren erythrocyte sedimentation rate 77 mm/h; antinuclear antibody absent; total serum complement activity 49 CH₅₀ units (normal 125–175); and serum IgG 13.4 g/l, IgM 3.6 g/l, IgA 4.8 g/l. Synovial fluid obtained from the left knee was turbid with poor mucin clot and $2.1 \times 10^9/l$ cells (87% neutrophils). Because of severe MTP pain and deformity, bilateral metatarsal head resections were performed; cultures at surgery were sterile. Pathological sections of resected metatarsal heads showed osseous destruction, hypertrophic synovium, and pannus proliferation without bone fragments.

CASE 3

A 59-year-old man with seropositive RA of 20 years' duration was admitted for evaluation of progressive polyarticular synovitis, leg ulcers, and a draining foot fistula. Physical examination showed filamentary keratitis, subcutaneous nodules, sensory polyneuropathy, periungual infarcts, necrotic ulcerations at the right ankle, and a draining fistula dorsally between the left 3rd and 4th MTP joints (Fig. 2A). Laboratory features showed white blood cell count $4.5 \times 10^9/l$; antinuclear antibody absent; total serum complement activity 116 CH₅₀ units; and absent serum cryoglobulins. Cultures of fistula drainage were sterile. Ulcers subsequently appeared on the left leg; a left above-knee amputation was performed because of intractable pain. Serial section of the amputated specimen showed pannus-eroded metatarsal heads and proximal phalanges with extensive subchondral cyst formation (Fig. 2B, C, and D). In addition to the fistula described above, a second fistula was noted adjacent to the proximal phalanx of the second toe (Fig. 2B).

FIG. 2 Classical fistulous rheumatism (Case 3). A. Draining fistula on the dorsum of the left foot between the 3rd and 4th toes is evident. B. Section of the amputated left foot outlines an additional fistula (probe) adjacent to the medial aspect of the proximal phalanx of the 2nd toe. (The metatarsal heads are numbered.) C. A more dorsal section through the 2nd, 3rd, and 4th MTP joints showing cartilage destruction (straight arrows) and bony erosions (curved arrows). D. Large erosions at the bases of these 2nd and 3rd proximal phalanges (curved arrows) are associated with marginal erosions of the metatarsal heads

C

D

Comment

Cases 1–3 developed sinuses in proximity to MTP joints. Historical and physical features were similar in these patients; all had pain, erythema, and drainage, but no fever. Cultures were consistently sterile. *X-ray* studies in each patient showed extensive joint destruction with

prominent subchondral cysts. Pathological specimens were obtained from each patient. In Cases 1 and 2, osseous destruction and pannus proliferation without apparent joint infection, bone fragmentation, or sequestra were noted. Serial sections of the amputated foot of Case 3 showed two sinus tracts extending from destroyed MTP joints to the skin.

CASE 4

A 43-year-old man with seropositive RA of 22 years' duration was examined for left hip pain and purulent drainage from multiple cutaneous sinuses. Three months previously he had developed peritonitis resulting from a ruptured colonic diverticulum. A diverting colostomy and removal of an inflammatory mass with a portion of the sigmoid colon were accomplished. After reanastomosis, a wound infection occurred; this resulted in disruption of the anastomosis and development of a left flank retroperitoneal abscess. Additional findings included subcutaneous nodules and rheumatoid deformities of wrists and PIP joints. A mucous fistula was present in the left upper quadrant of the abdomen. Another sinus in the midline below the umbilicus was discharging green purulent material. Draining abdominal and flank incisions were present. Laboratory investigations showed white blood cell count $10.3 \times 10^9/l$; antinuclear antibody absent; and normal serum complement. Cultures of the fistulae grew *Bacteroides* sp. and also *Escherichia coli* and anaerobic streptococci. X-rays showed several sinus tracts connecting bowel, left hip, and skin. The joint space was obliterated, and fragmentation and collapse of the femoral head were apparent (Fig. 3A). The left hip was explored, the necrotic femoral head was resected (Fig. 3B), and a modified Girdlestone procedure performed. Postoperatively, the hip became pain free; sinus drainage ceased after extensive antibiotic therapy.

CASE 5

A 46-year-old man with seropositive RA for 7 years developed severe systemic rheumatoid disease characterized by the sudden appearance of Sjögren's syndrome, multiple subcutaneous nodules, episodic unilateral blindness, mononeuritis multiplex, and peripheral gangrene. Laboratory investigations showed serum cryoglobulins containing IgG, IgM, rheumatoid factor, Clq, and C3, and no antinuclear antibody. Treatment included intravenous cyclophosphamide (10 mg/kg). After a year in hospital fever and increasing pain developed, and swelling of the right wrist and elbow, with a cutaneous sinus adjacent to the right elbow joint. Elbow X-rays showed a joint effusion, destruction of subchondral bone of the ulna and humerus, and a small bone fragment. Arthrography showed communication between the articular cavity of the elbow and the skin surface. Cultures of an aspirate from the elbow and the fistula drainage grew *Staphylococcus aureus*. The patient improved on antibiotics; the sinus tract closed.

CASE 6

A 62-year-old woman with seropositive RA for 24 years was admitted acutely ill with fever (39°C) and severe pain in the shoulders, knees, and hips. During the 2 years before admission, bilateral total knee and left hip arthroplasties had been performed. A spontaneously draining sinus, overlying the lateral aspect of a swollen erythematous right knee was noted. Gram's stain of fluid drained from the right knee and aspirated synovial fluid from both knees and hips showed clusters of Gram-positive cocci. Surgical drainage of the knees and hips was undertaken; pre-operative and intra-operative cultures grew *Staph. aureus* and *Pseudomonas aeruginosa* from all four joints. Treat-

ment included removal of the prostheses and appropriate antibiotics.

CASE 7

A 70-year-old woman with 20 years of seropositive RA was admitted with persistent pain and drainage of the left knee. One year before a left total knee replacement was performed. A month after surgery *Staph. aureus* was aspirated from an anterior draining sinus. A sinogram defined a communication between the fistula and the left knee. On admission the patient was febrile; the left knee was swollen and erythematous. Fluctuant areas were noted superiorly and inferiorly on the anterior surface of the knee; fistulous drainage was noted. *Staph. aureus* was recovered from drainage cultures. An arthrogram showed loosening of the prosthesis as contrast material passed from the knee joint around the tibial components between the cement and bone and outlined the channel extending to the skin.

Comment

Cases 4-7 developed increasing pain and swelling of one or several joints associated with fever and purulent drainage from an adjacent fistula. In each patient the same organism(s) was recovered from the fistula and the communicating joint. In Cases 3 and 5 bone fragmentation was also apparent; contrast evaluation in these two patients outlined communication between the skin and subjacent joint. In Cases 6 and 7 infection and subsequent fistulization followed total joint replacement.

CASE 8

A 52-year-old woman with RA (presence or absence of rheumatoid factor not ascertained) of 7 years' duration, who had had bilateral Baker's cysts for one year, developed a cystic swelling over the left Achilles tendon unaccompanied by fever. Three months before admission aspiration of the cyst showed thick yellow-brown viscous fluid which on microscopical examination showed cholesterol crystals. Four further aspirations in the next 2 months showed similar material. One month before admission spontaneous drainage occurred. On admission physical examination showed rheumatoid deformities, subcutaneous nodules, and a sinus draining clear fluid at the center of a cystic left Achilles swelling (Fig. 4A). At operation the cyst was seen in the popliteal space and it had dissected distally posterior to the gastrocnemius muscle and anterior to the soleus muscle (Fig. 4B). The cyst, 'dumbbell-shaped' $37 \times 4 \times 4$ cm, was excised. No preoperative or intra-operative cultures were obtained; however, a postoperative culture of serous drainage from the surgical site was sterile, and the wound healed without incident.

Comment

Case 8 showed a sinus in proximity to the Achilles tendon. Multiple cyst aspirations immediately preceded the apparently spontaneous fistulization, and surgical exploration showed the presence of a large dissecting popliteal cyst.

Discussion

Stedman's Medical Dictionary defines a fistula as a pathological sinus or abnormal passage leading from

A

B

FIG. 3 *Pyarthrosis with fistulization (Case 4). A. Frontal x-ray showing extensive abnormalities in the left hip including joint space loss, femoral head collapse, and fracture (arrow), fragmentation, and acetabular destruction. B. x-ray of the surgical specimen outlines the collapsed and sclerotic femoral head. The fracture (arrow) is apparent. (Reproduced with permission from D. Resnick, Radiology, 114, 581, 1975)*

A

FIG. 4 Spontaneous fistulization of synovial cyst (Case 8). A. There is swelling along the back of the leg and a localized cyst overlying the Achilles tendon with a small opening at its center. B. During surgical exploration the extent of the dissecting popliteal cyst is evident (arrows)

B

an abscess cavity or a hollow organ to the surface, or from one abscess cavity to another. The entire definition is required to include the eight patients presented in this study. Several contrasting syndromes characterized by periarticular cutaneous sinuses occurred in this group of patients.

CLASSICAL FISTULOUS RHEUMATISM

Bywaters (1953) described two women with an insidious complication of rheumatoid arthritis, 'fistulous rheumatism', an entity featuring chronic skin sinuses occurring near affected joints. Ten years later a third patient with similar features was described (Rosin and Toghil, 1963). All three patients were women; at least two of them were seropositive, one with subcutaneous nodules. In each patient erythematous periarticular nodules erupted, forming draining sinuses, often multiple, in the vicinity of the hands and feet. The sinus drainage was usually sterile, although *Staph. pyogenes* was cultured from each patient on at least one occasion. Fistulas drained over a period of weeks to months; fever was

rare. X-ray features were similar in all patients and included marked joint destruction, with cystic erosions and soft tissue bone fragments. Pathological features included pannus formation and fragments of necrotic bone and cartilage.

Cases 1-3 in this report showed manifestations similar to those described above. Historical features, physical findings of indolent drainage from small joints, x-ray characteristics of marked destruction and cyst formation, and pathological aberrations of bone destruction and pannus proliferation, without evidence of infection in bone or joint structures, are remarkably consistent with the earlier observations.

The pathogenesis of classical fistulous rheumatism is not certain. Bywaters (1953) suggested that synovial fluid, under pressure created by joint motion, intruded beneath the subchondral cartilage, enlarging bone cysts. With continuing physical activity, microfractures and bone necrosis occurred. When large or numerous, the bone fragments were extruded as foreign bodies which formed abscesses that ruptured to the skin surface. The presence of bone fragments

within granulation tissue and sinus tracts suggests the participation of bone necrosis with subsequent inflammatory response as a major factor in the genesis of fistulous rheumatism, but the three patients in this report, although clinically and radiographically similar to the patients previously described, showed no evidence of bone or cartilage fragmentation in detailed pathological studies. Recent observations suggest that such debris is not unusual in rheumatoid arthritis and can be correlated with severity and duration of disease (Muirden, 1970). As a large number of rheumatoid patients apparently have bone fragments within joints which never fistulize, and fistulas are relatively unusual in other arthritides characterized by extensive intra-articular bone and cartilage debris such as neuropathic joint disease, a causal relationship between such fragmentation and subsequent fistulization is only speculative.

Prominent subchondral cyst formation in patients with classical fistulous rheumatism suggests the presence of raised intra-articular pressure (Jayson, Rubinstein, and Dixon, 1971). Similar subchondral and/or synovial cysts defend against raised intra-articular pressure in large joints. In rare circumstances (see below), apparent transmission of increased intra-articular pressure in a large joint to a synovial cyst may result in spontaneous fistulization and decompression at the skin surface. It may be possible that small joints of the hands and feet, anatomically limited in such cyst formation and, in the feet, subject to the 'pressure' of weight bearing, would fistulize as a protective mechanism for reducing abnormal intra-articular pressure.

The evidence suggests that in classical fistulous rheumatism, infection, if present, is superficial and a secondary phenomenon; joint structures and underlying bone remain sterile.

JOINT SEPSIS WITH SUBSEQUENT FISTULIZATION

Septic arthritis is a recognized complication of rheumatoid arthritis and is more frequently seen in patients who manifest high titre rheumatoid factor, extensive joint destruction, systemic rheumatoid disease (Karten, 1969), and hypocomplementaemia (Hunder and McDuffie, 1973). Intra-articular administration of corticosteroids often precedes joint infection in rheumatoid patients. A previous report described two patients who displayed cutaneous fistulas which were directly related to septic joints

(Kellgren, Ball, Fairbrother, and Barnes, 1958). Both patients were seropositive with subcutaneous nodules and severe erosive joint disease. In each case *Staph. aureus* was recovered from joint fluid and/or sinus drainage.

Infectious arthritis is a feared complication of prosthetic joint surgery in rheumatoid patients, although its reported incidence is variable (Bryan, Peterson, and Combs, 1975; Coventry, Upshaw, Riley, Finerman, and Turner, 1973). Clinical characteristics include pain, fever, and limited range of motion. X-rays frequently show increasing radiolucency surrounding the barium impregnated cement which anchors the prosthesis to the bone (Dolinskas, Campbell, and Rothman, 1974).

In four of our patients, (Cases 4-7) septic arthritis preceded fistulization. Clinical course was characterized by increasing pain in single or multiple large joints, fever, and the appearance of sinuses draining purulent material. Cultures from sinus drainage and synovial fluid yielded the same organism.

Obvious clinical and x-ray differences distinguish this group of patients from those with classic fistulous rheumatism. Sepsis was the primary event and features of infection, including marked pain, swelling, and fever, were prominent. Affected joints were large, and in two instances contained total joint prostheses; cultures were consistently positive.

MISCELLANEOUS

Synovial cysts, although a frequent complication of rheumatoid arthritis, rarely fistulize (Genovese, Jayson, and Dixon, 1972; Gerber and Dixon, 1974). Although reports of spontaneous fistulization of popliteal cysts in rheumatoid patients have appeared (Gerber and Dixon, 1974), this complication is more frequent after direct aspiration (Pavelka, Sůstra, and Středa, 1972). Case 8 in the present series developed a giant popliteal cyst which dissected toward the ankle. Multiple diagnostic and therapeutic aspirations of a cystic mass at the ankle were followed by apparent spontaneous fistulization; the mass and underlying popliteal cyst required surgical removal.

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