ABSTRACT

This paper reports two cases of acrometastasis to the hands. The first case involved a 78-year-old woman with a permeative osteolytic lesion in her proximal second metacarpal. A biopsy of this lesion suggested a diagnosis of non-small-cell lung carcinoma with secondary osseous metastasis. This was the first presentation of the woman’s primary diagnosis. A single 8-Gy fraction of palliative radiotherapy was delivered to the patient’s left hand. The treatment proved successful: the woman soon experienced pain relief and regained the use of her hand. The second case involved a 69-year-old woman with extensive lytic destruction involving the proximal two thirds of her third metacarpal. This patient had been diagnosed with carcinoma of the breast in 1990. She also received a single 8-Gy fraction of radiation, which improved both her pain and her hand mobility.

An extensive review of the literature uncovered 257 previously reported cases of acrometastasis. Articles were analyzed based on age and sex of the patient, site of the primary carcinoma, metastatic locations within the hand and affected appendage or appendages, the treatment given, and the patient’s length of survival. Men were almost twice as likely to experience acrometastasis as women, and the median age of the patients overall was 58 years (range: 18 months–91 years). Lung, kidney, and breast carcinoma were the three most prevalent primary diagnoses reported in the literature. Cancers of the colon, stomach, liver, prostate, and rectum affected the remainder of the population.

Overall, the right hand was more often host to the metastatic lesions. In addition, almost 10% of the patients experienced lesions in both hands. The third finger was the digit most affected by osseous metastases reported in the literature. Lesions of the thumb, fourth finger, second finger, and fifth finger were less commonly reported. The region of the digit most often affected within the patient population was the distal phalanx. The metacarpal bones, proximal phalanges, and middle phalanges comprised the remainder of the four most frequent acrometastatic sites. In the literature, single lesions were more prevalent than multiple bony lesions.

Based on the reported cases, amputation appeared to be the preferred method of treatment. Radiation, excision, and systemic therapy were the next most frequently used treatments. Patient survival was not well documented within the literature. However, the median survival of patients in the reported cases was 6 months. Thus, our review suggested that a diagnosis of hand metastasis is an indication of poor prognosis.

This report serves to emphasize the importance of properly diagnosing acrometastases. Identifying and effectively treating these metastases in a timely manner can lead to a dramatic improvement in a patient’s quality of life.

KEY WORDS

Acrometastasis, hand metastasis, bone metastases

1. CASE HISTORIES

1.1 Case 1

A 78-year-old woman presented with cachexia, decreased cognition, and left hand pain. The initial suspicion was that her symptoms were the result of an infection. Physical examination revealed a slightly tender elevated area on the back of the patient’s left hand. Radiographs revealed the presence of a permeative osteolytic lesion in the proximal left second metacarpal (Figure 1). This lesion extended from the epiphysis to the midshaft, with cortical perforation and soft-tissue extension. There was no evidence of pathologic fracture. A biopsy of the left hand lesion suggested a diagnosis of non-small-cell lung carcinoma with secondary osseous metastases. A computed tomography scan of the chest revealed a large right hilar mass. In addition, several osteolytic lesions were found in the pelvis, left ilium, left sacrum, right anterior superior iliac spine, and the cortex of the proximal medial femur.

A single 8-Gy fraction of palliative radiotherapy was concomitantly delivered to the patient’s left hand.
The treatment proved to be successful: the woman soon experienced pain relief and regained the use of her hand. For example, the patient was not able to hold even a fork with her left hand before radiotherapy. One month after radiotherapy completion, however, she was able to lift three plates with this hand. At the time of writing, 8 months later, the patient was still alive, but she had recently been diagnosed with brain metastases. Her left hand was still pain-free, and she continued to demonstrate an impressive range of motion.

1.2 Case 2

A 65-year-old woman presented with pain in the distal portion of her right forearm and swelling of the dorsum in her right hand. She had previously ignored these symptoms, because she believed that the swelling stemmed from her chemotherapy injection site. (She had been diagnosed with carcinoma of the breast in 1990.) A radiograph confirmed the presence of extensive lytic destruction involving the proximal two thirds of the third metacarpal (Figure 2). There was also evidence of focal lytic destruction of the distal margin of the capitate and the base of the fifth metacarpal. A lytic lesion was found in the midshaft of the ulna. This woman also had rib metastases.

The patient was treated with a single 8-Gy fraction of radiation to her hand. Seven months after her radiation treatment, the patient remained pain-free and claimed to have regained full use of her right hand.

2. DISCUSSION

Acrometastasis to the hands is not common, accounting for approximately 0.1% of all metastatic osseous involvement. Handley was the first to report this unusual manifestation in 1906. His initial report discussed the case of an elderly woman whose carcinoma of the breast had metastasized to multiple metacarpal bones. Because cancer patients are experiencing increased longevity, there is a greater opportunity for metastases to develop throughout the body. However, because of the uncommon presentation of secondary disease in the hands, it is difficult for physicians to consider the possibility of acrometastasis when diagnosing unusual hand conditions. In general, the lesion will appear similar to that of an infection, because patients often present with pain, redness or discoloration, tenderness, heat, swelling, erythema, or loss of function.

The mechanism responsible for the deposition of metastatic tumour cells within the hand is unclear, but an increase in blood flow or a trauma has been suggested in the past. Healey and colleagues reported that most patients they encountered with acrometastasis acquired the lesions in their dominant hand. That finding was assumed to be a result of the dominant hand being the one that receives a larger quantity of blood and possibly being the one more likely to undergo injury.
than the non-dominant hand\(^3\). That hypothesis echoed Joll’s concept of trauma-induced acrometastasis, given that he had previously described how repeated trauma may degrade the resistance of surrounding tissue, allowing tumour emboli to settle and grow within the skeletal tissue\(^7\). More recently, it has been suggested that the chemotactic factors (prostaglandins) that are released following a traumatic experience may be responsible for cell migration and adherence to osseous material\(^5\). That theory continues to support the notion that acrometastasis may be a result of a preceding physical injury. It should be noted that both of the women reported here were also affected in the dominant hand.

Bone metastases usually develop in areas rich in red marrow\(^8\). The scarce quantity of this tissue within the bones of the hand supports findings in the literature suggesting that secondary lesions arising in the terminal regions of the extremities are quite remarkable\(^8,9\). Primary lung tumours comprise almost 50% of all cancers that metastasize to the hands\(^10\). That finding is believed to be a result of the use of the systemic arterial system rather than the lymphatic system for distributing these particular tumour cells\(^10\). Other visceral tumours are less likely to result in acrometastases because their primary emboli do not reach the systemic arterial system until after they have passed through the capillary bed of the liver or the lung\(^11\).

Because acrometastases generally accompany widespread disease, the prognosis of patients with acrometastasis is poor\(^12\). Upon presentation of a metastatic hand lesion, patients are anticipated to survive merely 6 months\(^13\). This expectation means that pain palliation is often the primary objective of treatment in these individuals\(^11\). The status of the patient, localization of the lesion, and primary cancer site all dictate the treatment that the oncologist should use\(^9\). Amputation, radiotherapy, curettage, cementation, chemotherapy, and wide excision are the forms of treatment used most often\(^4,9,12\).

### 2.1 Literature Review

An extensive review of the literature generated 257 cases of acrometastasis. Table 1 summarizes the articles included. Articles were excluded if they were reported in a language other than English and French, unless an English abstract was provided. Articles were analyzed by age and sex of the patient, site of primary carcinoma, metastatic locations within the hand and affected appendage or appendages, treatment given, and the patient’s length of survival.

Based on the articles analyzed, men are almost twice as likely to experience acrometastasis as women. We found 155 cases of men with hand lesions as compared with 84 cases involving women. This finding has previously been acknowledged in the literature, with Asencio and colleagues reporting in 1982 that the sex balance is likely related to the primary cancer site most often responsible for acrometastasis\(^10\). It had previously been reported that lung is the origin of 47% of all cancers that metastasize to the hands\(^10\). Because of the strong relationship between cigarette smoking and the development of lung carcinoma, it is likely that men would experience a greater proportion of acrometastasis\(^10\). Men have been reported to engage more frequently in habitual smoking behaviour and thus would be anticipated to develop lung cancer and eventually secondary hand lesions more frequently than women do\(^10\).

The median age of patients affected by acrometastasis in our literature sample was 58 years, with a range of 18 months to 91 years. Within this population, 113 cases of hand metastases originated from lung cancer, comprising 44% of the cases. Lung was the number one primary cancer site within the sample. A kidney primary was responsible for the second greatest number of acrometastatic cases in the study population. The 31 patients with primary kidney carcinoma contributed 12% of the sample. Lastly, 26 cases of breast cancer resulted in the development of osseous hand lesions. These findings are similar to those previously reported within the literature, although breast carcinoma has been reported to provide equivalent or greater numbers of acrometastatic cases than cancer of the kidney does\(^5,14,15\). Patients with breast as the primary cancer site constituted 10% of the sample. The remaining cases originated from colon, stomach, liver, prostate, rectum, and numerous other cancers.

The right hand was more often involved than the left in the literature sample: 102 cases of osseous lesions were reported to have developed in the right hand as compared with only 84 cases in the left. That finding is consistent with the hypothesis that metastatic hand lesions occur within the dominant hand, because more members of the population are right-handed. Nonetheless, reports acknowledged 23 cases in which both hands were involved.

With 68 cases reported in the publications analyzed, the third finger was the digit most affected by osseous lesions. Next most frequent were the thumb (53 cases), the fourth finger (37 cases), the second finger (35 cases), and the fifth finger (25 cases). The distal phalanx was the region of the digit most affected by bone metastases. This area of the hand was the site of 74 secondary lesions. The metacarpal bones (56 cases), proximal phalanges (26 cases), and middle phalanges (16 cases) comprised the remainder of the four most frequent acrometastatic sites in the sample. Those findings are quite consistent in the literature\(^8,15,16\). Regions of the body with a reduced circulatory speed are preferential for secondary tumour growth\(^10\), which may explain the greater prevalence of lesions within the phalanges of the hand.

Single lesions occurred in 74% of the cases analyzed in the literature review. Again, this finding is consistent with the main primary cancer sites from which the lesions originated. Bronchial carcinomas are typically osteolytic, metastasizing to a single bone within the hand\(^17\). Conversely, breast cancer metastases are
sclerotic, lytic, or mixed, and often lead to multiple bony lesions. This difference is nicely demonstrated by the two cases presented in this report.

Amputation was the preferred method of treatment in the reported cases. Although treatment was not well reported in the published literature, 50 cases reported complete or partial amputation of the digits. Radiation (30 cases), excision (15 cases), and systemic therapy (10 cases) were the next most frequent treatments. Because amputation is recommended for pain palliation of terminal lesions in the hand, and the distal phalanges are the area most affected, it is quite reasonable that these findings were observed. The remaining treatments are consistent with proximal lesions. Both women reported in this paper presented with lesions of the metacarpal bones, and so radiation was an appropriate treatment selection. Radiotherapy served to relieve pain and to permit the patients to regain complete use of their hands. Thus radiotherapy is an effective and noninvasive treatment that improves a patient’s quality of life.

Survival was not always reported in the published literature. However, based on the cases that reported this outcome, the mean survival of the patients was 6 months. That finding reinforces the results from Hsu et al., who stated that the average length of survival in patients with hand metastases was merely 6 months. Thus, our extensive literature review confirmed that a diagnosis of metastasis is an indication of poor prognosis.

3. CONCLUSIONS

The present report serves to emphasize the importance of properly diagnosing acrometastases. The presence of cancerous lesions within the hands not only implies severe prognostic implications, but also a very treatable devastation to the patient’s independence. Identifying and effectively treating these metastases in a timely manner can ensure a dramatic improvement in the patient’s quality of life.

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5. REFERENCES

1. Kerin R. Metastatic tumors of the hand. J Bone Joint Surg Am 1983;65:1331–5.
2. Handley WS. Cancer of the Breast and its Operative Treatment. London: John Murray; 1906.
3. Healey JH, Turnbull AD, Miedema B, Lane JM. Acrometastases. A study of twenty-nine patients with osseous involvement of the hands and feet. J Bone Joint Surg Am 1986;68:743–6.
4. Ioia JV, Sumner JM, Gallagher T. Presentation of malignancy by metastasis to the carpal navicular bone. Clin Orthop Relat Res 1984;:230–3.
5. Tolo ET, Cooney WP, Wenger DE. Renal cell carcinoma with metastases to the triquetrum: case report. J Hand Surg [Am]
2002;27:876–81.
6. Khokhar N, Lee JD. Phalangeal metastasis: first clinical sign of bronchogenic carcinoma. South Med J 1983;76:927.
7. Joll CA. Metastatic tumors of bone. Br J Surg 1923;11:38–72.
8. Kerin R. The hand in metastatic disease. J Hand Surg [Am] 1987;12:77–83.
9. Ozcanli H, Ozdemir H, Ozenci AM, Söyüncü Y, Aydin AT. Metastatic tumors of the hand in three cases. Acta Orthop Traumatol Turc 2005;39:445–8.
10. Asencio G, Hafidi C, Pujol H, Allieu Y. Osseous metastases in the hand. A general review of three cases. Ann Chir Main 1982;1:137–45.
11. Amadio PC, Lombardi RM. Metastatic tumors of the hand. J Hand Surg [Am] 1987;12:311–16.
12. Shannon FJ, Antonescu CR, Athanasian EA. Metastatic thymic carcinoma in a digit: a case report. J Hand Surg [Am] 2000;25:1169–72.
13. Hsu CS, Hentz VR, Yao J. Tumours of the hand. Bk J Surg Oncol 2007;8:157–66.
14. Kerin R. Metastatic tumors of the hand. J Bone Joint Surg Am 1958;40;A:263–8.
15. Guttman G, Stein I. Metastatic tumor of the thumb from adenocarcinoma of the colon. Int Surg 1968;49:217–12.
16. Gallagher B, Yousef G, Bishop L. Subungual metastasis from a rectal primary: case report and review of the literature. Dermatol Surg 2006;32:592–5.
17. Libson E, Bloom RA, Husband JE, Stoker DJ. Metastatic tumours of bones of the hand and foot. A comparative review and report of 43 additional cases. Skeletal Radiol 1987;16:387–92.
18. Abrahams TG. Occult malignancy presenting as metastatic disease to the hand and foot. Skeletal Radiol 1995;24:135–7.
19. Adegbeyega PA, Adesokan A, Viegas SF. Acrometastasis of the phalanx from lung carcinoma: a case report. J Hand Surg [Am] 1999;2:1009–12.
20. Akjouj S, El Kettani N, Semlali S, et al. Thumb acrometastasis revealing lung adenocarcinoma: a case report with review of the literature. Chir Main 2006;25:106–8.
21. Amalaric R, Clément R, Roux G, Lesto J. On the incidence of osseous metastases from bronchial carcinomas [French]. J Radiol Electrol Med Nucl 1966;47:713–11.
22. Asthana S, Deo SV, Shukla NK, Raina V. Carcinoma breast metastatic to the hand and the foot. Australas Radiol 2001;45:380–2.
23. Bahk BJ, Rhee SK, Kang YK, Lee AH, Park JM, Chung YG. Gastric cancer acrometastases to all digits of one hand following closed intramedullary nailing. Skeletal Radiol 2006;35:529–32.
24. Barnett LS, Morris JM. Metastases of renal-cell carcinoma simultaneously to a finger and a toe. A case report. J Bone Joint Surg Am 1969;51:773–4.
25. Basora J, Fery A. Metastatic malignancy of the hand. Clin Orthop Relat Res 1975:182–6.
26. Bazez A, Salvador R, Dupré A, Cantala P. Symmetrical metastases of the tip of the ring finger, secondary to cancer of the larynx [French]. Bull Soc Fr Dermatol Syphiligr 1968;75:131–3.
27. Bell JL, Mason ML. Metastatic tumors of hand. A report of two cases. Quart Bull Northwestern University Med School 1953;27:114–16.
28. Bendick AJ, Jacobs AW. Report of a case of extensive generalized skeletal metastases following primary carcinoma of the breast. AJR Am J Roentgenol 1925;14:35–8.
renal cell carcinoma to a phalanx of the hand. Br J Urol 1978;50:280.

54. De Pass SW, Roswit B, Unger SM. Metastatic carcinoma in the bones of the hand; a report of two cases. Am J Roentgenol Radium Ther Nucl Med 1958;79:643–4.

55. Delsmann BM, Caselmann WH. Images in hepatology. Manifestation of hepatocellular carcinoma as osteolytic acrometastasis. J Hepatol 1997;26:1154.

56. Desmanet E, Amrani M, Fievez R, Six C. Acrometastases. Apropos of 2 cases. Review of the literature [French]. Ann Chir Main Membr Super 1991;10:154–7.

57. Dolich BH, Spinner M, Kaufman G. Isolated metastasis to the carpal bones. Report of a case. Bull Hosp Joint Dis 1970;31:78–84.

58. Drewes J, Sailer R, Schmitt-Graff A. Cancer metastases of the lungs [German, abstract]. Zentralbl Chir 1981;13:296–304.

59. Dubost C, Assens P, Garin G, Charbonnier JY. Bone metastasis from melanoma: a case study. Ann Chir Main Membr Super 1991;10:154–7.

60. Dyck P. Unusual metastasis of a pleural mesothelioma. (Report on an observed case) [German, abstract]. Clin Ter 2004;155:447–51.

61. Ekerot L, Eiken O, Jonsson K, Lindstrom C. Malignant festation of hepatocellular carcinoma as osteolytic metastasis of hepatocellular carcinoma: case report and review of the literature [Italian, abstract]. Eura Medicophys 1997;37:531–5.

62. Ekerot L, Eiken O, Jonsson K, Lindstrom C. Malignant hemangioendothelioma of metacarpal bones. Scand J Plast Reconstr Surg 1981;15:73–6.

63. Ferguson AD, Chall HG, Shapiro RI. Metastatic carcinoma of the hand. Hand 1963;41:20–1.

64. Floridis GG, Nixon CE, Ginsburg HM. Primary carcinoma of the parotid gland with rare metastasis. Arch Otolaryngol 1964;88:903–4.

65. Flynn JE. Discussant. J Bone Joint Surg [Am] 1987;69:280–3.

66. Fontana T, Siciliano M, Franceschelli A. Metastatic chondrosarcoma of the hand. J Craniomaxillofac Surg 1991;19:218–21.

67. Fragiadakis EG, Panayotopoulos G. Metastatic carcinoma of the hand. Hand 1972;4:268–72.

68. Frank VH, Pratt CI Jr. A lymphosarcoma with metastasis. J Oral Surg (Chic) 1951;9:19–24.

69. Freoni DR, Averill JH. Metastatic carcinoma of the lung to the thumb. Am J Surg 1952;83:115–16.

70. Froimson AI. Metastatic chondrosarcoma of the hand. Report of a case. Clin Orthop 1967;53:155–60.

71. Galmarini CM, Kertesz A, Oliva R, Porta J, Galmarini FC. Metastasis of bronchogenic carcinoma to the thumb. Clin Orthop 1962;179:115–16.

72. Gamblin TC, Santos RS, Baratz M, Landreneau R. Metastatic colon cancer to then hand. J Bone Joint Surg [Am] 1987;69:280–3.

73. Gartmann H. Metastasis of seminoma of the skin [German, abstract]. Dermatol Wochenschr 1958;138:828–9.

74. Gelberman RH, Stewart WR, Harrelson JM. Hand metastasis from melanoma: a case study. Clin Orthop Relat Res 1978;264–6.

75. Ghert MA, Harrelson JM, Scully SP. Solitary renal cell carcinoma metastasis to the hand: the need for wide excision or amputation. J Hand Surg [Am] 2001;26:156–60.

76. Giberti C, Mantero R, Schiennone M, Costa M, Lavagna M. Unusual location for secondary bone metastasis from advanced renal cell carcinoma. Acta Urol Ital 1999;3:177–8.

77. Gold GL, Reefe WE. Carcinoma and metastases to the bones of the hand. JAMA 1963;184:237–9.

78. Gottlieb JA, Schermer DR. Cutaneous metastases from carcinoma of the colon [letter]. JAMA 1970;213:2083.

79. Graham WP, Kilgore ES, Williams EH, Gordon SL. Metastatic tumours of the hand. Hand 1973;5:177–9.

80. Grant KB, Roller GJ. Metastasis of bronchogenic carcinoma to the terminal phalanx of a finger. J Iowa Med Soc 1966;56:1132–5.

81. Greene MH. Metastasis of pulmonary carcinoma to the phalanges of the hand. J Bone Joint Surg 1957;39-A:972–5.

82. Greither A, Tritsch H. Die geschwulste der haut. Stuttgart, Germany: Thieme; 1957.

83. Grilli FP. Report of two cases of carcinoma metastasis to the bones of the hand [Italian, abstract]. Eura Medicophys 1958;30-vr:386–3.

84. Hammer B, Gollmann G. Metastases of the phalanges in bronchial carcinoma. Contribution on the survival time. Munch Wochenschr 1972;114:61–4.

85. Hatakeyama S, Tachibana A, Suzuki K, Okano H. A case of metastasis to the metacarpal bone of the right thumb from squamous cell carcinoma of the lung [Japanese, abstract]. Jpn J Lung Cancer 1997;37:531–5.

86. Hicks MC, Kalmon E Jr, Glasser SM. Metastatic malignancy to phalanges. South Med J 1964;57:85–8.

87. Hindley CJ, Metcalfe JW. A colonic metastatic tumor in the hand. J Hand Surg [Am] 1987;12:803–5.

88. Horn Y. Metastatic iodophilic carcinoma of thyroid to a hand bone. J Surg Oncol 1982;19:123–6.

89. Hummel J, Scott RM. Adenocarcinoma of the rectum with metastases to a phalanx: a case report. J Ky State Med Assoc 1962;60:158–9.

90. Karten I, Bartfeld H. Bronchogenic carcinoma simulating early rheumatoid arthritis. Metastases to the finger. JAMA 1962;179:162–4.

91. Keramidas E, Brotherston M. Extensive metastasis to the hand from undiagnosed adenocarcinoma of the lung. Scand J Plast Reconstr Surg Hand Surg 2005;39:113–15.

92. King DT, Gurevitch AW, Hirose FM. Multiple cutaneous metastases of a scapular chondrosarcoma. Arch Dermatol 1978;114:584–6.

93. Kinsella DL Jr. Unusual metastasis of a renal cell carcinoma. South Med J 1957;50:803–5.

94. Knapp D, Abdul–Karim FW. Fine needle aspiration cytology of acrometastasis. A report of two cases. Acta Cytol 1994;38:589–91.

95. Kolar J, Jakoubková J, Kácl J, Vacura J. Symmetrical bone metastases of the hand [German, abstract]. Zentralbl Chir 1981;13:296–304.

96. Kolmar I, Bartfeld H. Bronchogenic carcinoma simulating early rheumatoid arthritis. Metastases to the finger. JAMA 1962;179:162–4.

97. Kotlar J, Jakoubková J, Kácl J, Vacura J. Symmetrical bone metastases of the hand [German, abstract]. Zentralbl Chir 1981;13:296–304.

98. Gottlieb JA, Schermer DR. Cutaneous metastases from carcinoma of the colon [letter]. JAMA 1970;213:2083.

99. Kumar PP, Kovi J. Metastases to bones of the hand and feet. JAMA 1964;184:237–9.

100. Kumar PP. Metastases to the bones of the hand [Italian, abstract]. Eura Medicophys 1958;30-vr:386–3.
mous cell carcinoma in childhood: a case report. J Pediat Surg 1977;12:519–21.
101. Lambert D, Escallier F, Collet E, et al. Distal phalangeal metastasis of a chondrosarcoma presenting initially as bilateral onycholysis. Clin Exp Dermatol 1992;17:463–5.
102. Lee KS, Lee SH, Kang KH, Oh KJ. Metastatic hepatocellular carcinoma of the distal phalanx of the thumb: a case report. Hand Surg 1999;4:95–100.
103. Lewin JS, Cleary KR, Eicher SA. An unusual metastasis to the thumb in a laryngectomized tracheosophageal speaker. Arch Otolaryngol Head Neck Surg 1997;123:1007–9.
104. Lombard A, Seignon B, Level MC, Dubois de Montreynaud JM, Gougeon J. Phalangeal metastasis simulating osteoitis and manifesting a bronchial cancer [French]. Sem Hop Paris 1976;52:119–21.
105. Mangini U. Tumors of the skeleton of the hand. Arch Otolaryngol 1960;72:142–6.
106. Marcove RC, Charosky CB. Phalangeal sarcomas simulating infections of the digits. Review of the literature and report of four cases. Clin Orthop Relat Res 1972;83:224–31.
107. Marmor L, Horner RL. Metastases to a phalanx simulating infection in a finger. Am J Surg 1959;97:236–7.
108. Martin KA, Dove AF. Metastatic carcinoma of the hand. Hand 1983;15:343–6.
109. Mendez Lopez JM, Garcia Mas R, Salva Coll G. Metastasis of an adenocarcinoma of the colon to the first metacarpal bone [French, abstract]. Ann Chir Main Membr Super 1999;4:95–100.
110. Marcove RC, Charosky CB. Phalangeal sarcomas simulating infections of the digits. Review of the literature and report of four cases. Clin Orthop Relat Res 1972;83:224–31.
111. Michel PJ, Colson P, Pipard C, Grannad P. Ulcerated epithelioma of the back of the hand, a metastasis with exceptional localization, remaining a single metastasis for several years, in a patient operated 30 years earlier for cancer of the breast [French]. Bull Soc Fr Dermatol Syphiligr 1967;74:780–3.
112. Midell AI, Lochman DJ. An unusual metastatic manifestation of a primary bronchogenic carcinoma. Cancer 1972;30:806–9.
113. Miyakawa M, Ito M, Ueyama H, Kuze M. Metastasis of penile cancer to the skin of thumb—a study on metastasis of the penile cancer [Japanese, abstract]. Hinyokika Kiyo 1972;18:88–96.
114. Mladenovic V, Nikolic J, Kerimovic D. Metastasis of bronchial carcinoma in the bones of hands and feet. [Croatian, abstract] Reumatizam 1972;19:138–46.
115. Mohnty S, Federowicz TE, Ueharra H. Metastatic lesions of the fingers. Surgery 1968;64:411–15.
116. Morris DM, House HC. The significance of metastasis to the bones and soft tissues of the hand. J Surg Oncol 1985;28:146–50.
117. Müller S, Dörner A, Dallek M, Supra T. Hand metastases—a rare metastatic form of colorectal carcinoma [German, abstract]. Dtsch Med Wochenschr 1988;113:728–30.
118. Mulvey RB. Peripheral bone metastases. Am J Roentgenol Radium Ther Nucl Med 1964;91:155–60.
119. Nadzhmitdinov NN, Zadarski-LT. A rare site of metastasis of the breast cancer [Russian, abstract]. Klin Khir 1970;5:50–1.
120. Nagendran T, Patel MN, Gaillard WE, Imm F, Walker M. Metastatic bronchogenic carcinoma to the bones of the hand. Cancer 1980;45:824–8.
121. Nissenbaum M, Kutz JE, Lister GD. Clear-cell carcinoma of the lung metastatic to the hamate. Clin Orthop Relat Res 1978;293–6.
122. Nobuhara K, Itohara M, Tateishi H, Shibata M. Metastatic malignant tumor erroneously diagnosed as felon of the little finger [Japanese, abstract]. Seikoku Geka 1967;18:141–5.
123. Panebianco AC, Kaupp HA. Bilateral thumb metastasis from breast carcinoma. Arch Surg 1968;96:216–18.
124. Pantoja E, Cross VF, Vitala P, Wendth AJ. Neoplastic involvement of terminal digits masquerading clinically as benign disease. Rev Interam Radiol 1976;1:9–13.
125. Patel MR, Sanchez HJ, Silver JW, Pearlman HS. Metastatic carcinoma of hand. Clinical manifestations of occult or overt bronchogenic carcinoma. N Y State J Med 1978;78:2233–7.
126. Pfeiffer K. Study on peripheral skeletal metastasis [German, abstract]. Z Gesamt Med Inn Med 1959;14:244–2.
127. Pirschel J, Metzger HO, Wissmann C. Malignant metastases to the periphery of the skeleton [German, abstract]. ROFO 1978;129:621–6.
128. Pobanz DM, Condon JV, Baker LA. Plasma-cell myelomatosis: report of a case with multiple large tumors involving the digits of both hands. AMA Arch Intern Med 1955;96:828–32.
129. Raissoni Z, Ismael F, Elmriti A, Boutayeb F. Acrometastasis of the hand. Case report [French, abstract]. Acta Orthop Belg 2002;68:297–300.
130. Rebolj J, Deologne G, Bobo J, Sorin Y. Radio-clinical study of secondary cancer of the bone [French]. Ann Radiol (Paris) 1960;3:727–51.
131. Reichbach EJ, Levinson JD, Fagin RR. Unusual osseous metastases of hepatoma. JAMA 1970;213:2078–9.
132. Rendich RA, Levy AH. Unusual metastatic bone lesions. Am J Roentgenol Radium Ther Nucl Med 1941;46:343–50.
133. Riba LW. Testicular tumors: chorionepithelioma with generalized and skin metastases. Surg Clin North Am 1950;30:151–66.
134. Riter HG, Ghobrial IM. Renal cell carcinoma with acrometastasis and scalp metastasis. Mayo Clin Proc 2004;79:76.
135. Rolle J, Bernh I. Isolated metastases from bronchiale carcinoma to the right thumb [German, abstract]. Handchirurgie 1974;6:148.
136. Ross EF, Fodden JH. Metastasis of bronchogenic carcinoma: report of a case with multiple skeletal metastases. Am J Med 1985;79:519–21.
137. Rosse EA, Fotheringham KN. Metastatic bronchogenic carcinoma masquerading as a felon. J Hand Surg [Am] 1983;8:325–8.
138. Ross EF, Fotheringham KN. Metastatic bronchogenic carcinoma to thumb. Can Med Assoc J 1949;61:310–12.
139. Ruggiero A, Borri M. Rare localization of bony metastases revealed in renal cell carcinoma [Italian, abstract]. Nunt Radiol 1955;21:209–20.
140. Sahbaz S, Kilinc O, Vayvada H, Topcu A, Yörükolu K, Ucan ES. Distal phalanx metastasis in operated bronchial carcinoma [Turkish, abstract]. Tuberk Toraks 2004;52:378–81.
141. Sahbaz S, Kilinc O, Vayvada H, Topcu A, Yörükolu K, Ucan ES. Distal phalanx metastasis in operated bronchial carcinoma [Turkish, abstract]. Tuberk Toraks 2004;52:378–81.
142. Seyss R. Malignant tumors of the phalanges [German, abstract]. Handchirurgie 1976;1:9–13.
145. Smithers DW, Price LRW. Isolated secondary deposits in terminal phalanx in case of squamous cell carcinoma of lung. *Br J Radiol* 1945;18:299–300.

146. Sneddon J. Painless metastatic deposit in a finger presenting as a pulp infection with osteitis. *Br J Clin Pract* 1969;23:511–13.

147. Stock HJ. Two unusual bone tumours of the hand [German, abstract]. *Zentralbl Chir* 1977;102:420–5.

148. Strang R. Phalangeal metastases as a first clinical sign of bronchogenic carcinoma. *Br J Surg* 1952;39:372–3.

149. Taddei L, Pistocchi F. Phalangeal carcinomatous metastases [Italian, abstract]. *Radiol Med (Torino)* 1965;51:145–50.

150. Tomas X, Conill C, Combalia A, Jaume P, Castel T, Nicolau C. Malignant melanoma with metastasis into the capitate. *Eur J Radiol* 2005;56:362–4.

151. Tonneur G, Verschraegen J, Depauw A, Leempoel A. Metastatic tumor of the hand. Apropos of a case [French]. *Acta Chir Belg* 1969;68:141–6.

152. Toubiana CG, Proux CH. Distal bone metastases [French]. *Ann Radiol (Paris)* 1965;8:217–18.

153. Trachtenberg AS, Roswit B. Bronchogenic carcinoma metastatic to the hand. *Am J Roentgenol Radium Ther Nucl Med* 1961;85:886–90.

154. Troncoso A, Ro JY, Grignon DJ, et al. Renal cell carcinoma with acrometastasis: report of two cases and review of the literature. *Mod Pathol* 1991;4:66–9.

155. Uriburu IJF, Morchio FJ, Marin JC. Metastases of carcinoma of the larynx and thyroid gland to the phalanges of the hand. Report of two cases. *J Bone Joint Surg Am* 1976;58:134–6.

156. Vadivelu R, Drew SJ. Phalangeal metastasis secondary to an occult breast carcinoma. *Arch Orthop Trauma Surg* 2002;122:530–1.

157. Vaezy A, Hudson DC. Phalangeal metastases from bronchogenic carcinoma. *JAMA* 1978;239:226–7.

158. Vancura J, Jakoubková J, Kolár J. Metastases in small bones of the hand in pulmonary cancer [German, abstract]. *Zentralbl Chir* 1960;85:1554–7.

159. Vine JE, Cohen PR. Renal cell carcinoma metastatic to the thumb: a case report and review of subungual metastases from all primary sites. *Clin Exp Dermatol* 1996;21:377–80.

160. Vinod SU, Gay RM. Adenoid cystic carcinoma of the minor salivary glands metastatic to the hand. *South Med J* 1979;2:1483–5.

161. Viswanathan PN, Rangad F, Roul RK. Metastases to the hand from carcinoma of the lower alveolus. *J Hand Surg [Br]* 1996;21:544–6.

162. Vittali HP. Metastatic tumors of the bones of the hand [German, abstract]. *Arch Orthop Unfallchir* 1961;53:364–70.

163. Warda E, Kaminski J, Modrzewski K. Tumors and tumor-like lesions of the hand [Polish, abstract]. *Chir Narzadow Ruchu Ortop Pol* 1974;9:773–8.

164. Weidmann CE, Ganz PA. Multiple synchronous lesions of acral metastasis. *West J Med* 1984;140:451–6.

165. Wu KK, Guise ER. Metastatic tumors of the hand: a report of six cases. *J Hand Surg [Am]* 1978;3:271–6.

166. Wu KK, Winkelman NZ, Guise ER. Metastatic bronchogenic carcinoma to the finger simulating acute osteomyelitis. *Orthopedics* 1980;3:25–8.

167. Zakharov BI. Case of metastasizing cancer of the esophagus into the ungual phalanx [Russian, abstract]. *Vestn Rentgenol Radiol* 1970;45:102–3.

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