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Review

Kaposi sarcoma in unusual locations

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Abstract

Kaposi sarcoma (KS) is a multifocal, vascular lesion of low-grade malignant potential that presents most frequently in mucocutaneous sites. KS also commonly involves lymph nodes and visceral organs. This article deals with the manifestation of KS in unusual anatomic regions. Unusual locations of KS involvement include the musculoskeletal system, central and peripheral nervous system, larynx, eye, major salivary glands, endocrine organs, heart, thoracic duct, urinary system and breast. The development of KS within wounds and blood clots is also presented. KS in these atypical sites may prove difficult to diagnose, resulting in patient mismanagement. Theories to explain the rarity and development of KS in these unusual sites are discussed.

Background

Kaposi sarcoma (KS) is a vascular lesion of low-grade malignant potential that is associated with Human Herpesvirus-8 (HHV8) infection. KS is a multifocal tumor that manifests most frequently in mucocutaneous sites, typically the skin of the lower extremities, face, trunk, genitalia and oropharyngeal mucosa (Table 1). KS also commonly involves lymph nodes and visceral organs, most notably the respiratory and gastrointestinal tracts. Peculiar presentations of KS reported in relation to the gastrointestinal tract involvement include primary KS of the appendix [1], isolated rectal KS [2], and KS with mesenteric localization [3]. Scores of authors have reported on the occurrence of KS in numerous unusual sites (i.e. anatomic locations other than the aforementioned sites). This review discusses the manifestation of KS in several of these unusual regions of the human body, and highlights what can be learned from these perceptive published observations.

Musculoskeletal system

KS involvement of the musculoskeletal system is a rare occurrence [4]. Nevertheless, around 70 such cases have been reported. Dr. Moriz Kaposi was the first to document KS involvement of the skeletal system. He described ulcerating KS lesions on the extremities of his patients that penetrated into underlying bone [5]. Limited early literature, pre-dating the AIDS epidemic, reported that skeletal involvement was a frequent (~20%) finding in African (endemic) KS [6-8]. The largest review to date on KS involvement of the musculoskeletal system included 66 previously published cases reported from 1925 to 2006 [9]. Only three cases in this review included KS within skeletal muscle, all AIDS-related KS, that had infiltrated the gastrocnemius muscle [10], intercostal muscles with associated rib destruction [11], and the masseter muscle in association with oral KS [12]. Within the musculoskeletal system, osseous KS lesions are more frequently encountered than KS in skeletal muscle. Involvement of bone marrow, without causing an osseous lesion, is far more common in AIDS-related KS [13-16]. In a series of

Table 1: Usual and unusual anatomical locations of Kaposi sarcoma

Usual Locations	Unusual Locations
• Skin	• Bones & skeletal muscles
• Oral mucosa	• Peripheral nerves
• Lymph nodes (superficial & deep)	• Brain & spinal cord
• Lungs, endobronchial tract, & pleura	• Larynx
• Gastrointestinal tract	• Eye & ear
• External genitalia	• Major salivary glands
• Oropharynx	• Adrenal & thyroid gland
• Tonsils	• Heart
• Nasal cavity	• Thoracic duct
• Liver	• Kidney
• Spleen	• Ureter & urinary bladder
• Bone marrow	• Breast
	• Gonads
	• Pancreas
	• Wounds & blood clots

45 HIV-positive patients manifesting with musculoskeletal abnormalities, researchers found that only two individuals had KS of the bone [17]. Most of the patients in this series had infections and several had bone lymphomas.

The musculoskeletal system has been shown to be involved by all KS epidemiological forms, including AIDS-related, Classic, African (endemic), and infrequently transplanted-associated KS [9,18-21]. Reports of African KS bone lesions originated mainly from central Africa (e.g. Uganda), but also from Northern African countries (e.g. Algeria, Morocco) and from South Africa. Despite an extensive literature search, we were able to identify only a single case of transplanted-associated KS involving bone. This particular 40 year-old female transplant recipient, who was being treated with cyclosporine, died 8.3 months after her kidney transplant of disseminated KS, diagnosed only by post-mortem examination [22].

African and Classic KS lesions tend to involve the peripheral skeleton, whereas AIDS-related KS more commonly involves the axial skeleton (vertebrae, ribs, sternum, and pelvis) and/or maxillofacial bones [9,23-32]. KS of the skull has been noted in the parietal and temporal bones, paranasal sinus, maxilla, hard palate and mandible. Other bones reported to be involved by KS include the vertebrae (T11 to L4), ribs, sternum, pelvis, long bones of the extremities (humerus, radius, ulna, femur, tibia, fibula), as well as those of the hands (metacarpals) and feet (talus, calcaneus, and the 3rd, 4th and 5th metatarsals). Asymmetric bone involvement by KS appears to be the rule. Joint involvement is unusual, but has been reported [33].

Osseous KS lesions are more likely to be associated with long-standing and locally aggressive cutaneous African and Classic KS lesions, or with AIDS-associated mucosal KS lesions that penetrate underlying bone [9]. Patients with osseous KS may complain of bone pain with limited mobility. Serious sequelae have occurred, such as acute spinal cord compression [34,35]. KS of the jaw bones can cause pain, headache, increased tooth mobility, paresthesia, or can present with an intraoral tumor mass. Infrequently, osseous KS lesions may be asymptomatic and remain undetected, or may be discovered only incidentally or at autopsy. Pathological fractures in afflicted patients do not seem to be a problem. KS involvement of bone without KS disease elsewhere is exceptional [9]. Patients with osseous KS usually have concomitant non-osseous KS lesions, particularly those with AIDS. Very few cases, all AIDS patients, have had primary intraosseous KS [25,36,37]. Most of the cases reported in the literature to date were due to KS arising in overlying skin or mucosa, in which KS eroded into underlying bone [4,9]. Those with AIDS-associated osseous KS often present with a CD4+ T-cell count of <100 cells/mm^3[9]. AIDS-related KS that involves bone usually portends an unfavorable prognosis [9,38].

Most osseous KS lesions are osteolytic, with cortical and at times almost complete bone destruction (osteolysis). KS of the bone does not present well on plain radiographs, despite their frequent osteolytic nature [38-40]. CT scan and MRI appear to be superior for the detection of KS bone lesions [9,11]. Biopsy of a suspected KS lesion is essential, because other conditions such as bacillary angiomatosis can present with similar clinical and radiological findings [41]. Radiation therapy has provided patients with prompt relief of bone pain [13,21,31]. Treatment of osseous KS whether by surgery, chemotherapy and/or radiation seems to have limited success [1,9]. Nevertheless, individual case reports describing improvement of patients following radiation and/or systemic chemotherapy have been published [26,36,42]. Patient's response to therapy requires monitoring radiological changes in addition to routine clinical observation. With intraosseous KS involvement, successful management generally requires a multidisciplinary approach [43].

Nervous system

1. Peripheral nervous system

Peripheral nerve involvement by KS is rare. In a postmortem study of temporal bones obtained from patients with AIDS, investigators discovered KS in the eighth cranial nerve of one patient [44]. An autopsy in this individual revealed concomitant KS of the skin and lungs. In another study of African KS cases, KS was portrayed growing along perineural spaces of large nerves [45]. This paper also described small nerves encased in subcutaneous KS nod-

ules. The only case with documented peripheral nervous system involvement is of a 75-year-old woman who presented with low back and leg pain, asymmetrical lower leg weakness, muscle wasting, paresthesiae, and bilateral lower extremity edema [46]. At autopsy, KS was identified infiltrating the lumbar spinal cord, sacral plexus, sciatic and femoral nerves of this patient. In the spinal cord there was nearby recent microinfarction, and petechial hemorrhage was noted. Along involved peripheral nerves there was associated endoneurial edema and massive destruction of axons and myelin sheaths. Two lumbar dorsal root ganglia contained KS tumor in their capsules. Sections taken from distal popliteal nerves showed wallerian degeneration. Skeletal muscle from the lower extremities in this individual revealed neurogenic atrophy.

2. Central nervous system (CNS)

2.1 Brain

Around 15 cases of suspected brain involvement with KS have been reported [47-58], but in only a few of these cases did an autopsy actually confirm KS within intracranial lesions [50,52,55]. Human herpes virus-8 (HHV8) DNA was detected by PCR in one patient's intracranial lesion [58]. In a review of a transplant tumor registry in Israel, of 29 donors with CNS tumors 7% were due to KS [59]. Patients with Classic, African, AIDS-related and transplant-associated KS epidemiological forms involving the brain have all been reported. KS has been documented predominantly in the cerebrum, but has been noted also in the cerebellum, pons, meninges and dura mater. KS within the brain appears to almost always occur with generalized KS disease, including widespread visceral involvement. Symptoms related to brain KS are not well reported. One patient (16-year-old boy) with transplant-associated intracranial KS presented with a generalized tonic and clonic seizure [58]. Another patient with African KS developed hemiparesis and urinary incontinence due to widespread KS involvement of her skull, vertebrae and brain [50]. At autopsy, this patient's brain lesions included five well-delineated nodules of KS, showing considerable hemorrhage and necrosis. KS tumor cells in these nodules were reported to be markedly pleomorphic.

A few of the cases reported have been regarded with some suspicion by others, as the patients in these reports did not have skin lesions [60]. Based upon available information, KS brain lesions have ranged in size from 2 mm to large (up to 2 cm) destructive deposits. The radiologic appearance of intracranial KS has only been rarely described [52,61]. On CT scan, KS appears as homogeneous, hyperdense lesions with little surrounding edema and minimal mass effect. On MRI, brain KS lesions also appear as a homogeneous mass, of high signal intensity with a relatively T2 weighted sequence. In one case the CT scan (without contrast material) was negative, while the MR image showed an abnormal focus.

2.2 Spinal cord

There have been two cases of KS infiltrating the spinal cord [34,48]. In one patient presenting acutely with spinal cord compression, there was concomitant destructive KS of the thoracic and lumbar vertebrae [34]. In the other patient with chronic neurological symptoms, KS involved the lumbar spinal cord [48]. Autopsy in this latter individual also revealed nearby recent microinfarction and petechial hemorrhages in the spinal cord.

Larynx

Head and neck involvement of KS is not unusual. However, laryngeal involvement is somewhat of an infrequent manifestation. There have been approximately 25 accounts of KS of the larynx [62-73]. Most patients have had AIDS-related KS, although HIV-negative persons with laryngeal KS have also been noted [72,74]. Of the AIDS cases reported, the majority (91%) were males of mean age 35 years (range 24–56 years), with advanced HIV disease, that were antiretroviral naïve [73]. This may explain why many afflicted persons also had oropharyngeal, as well as cutaneous and visceral KS.

Presenting symptoms may include hoarseness, throat discomfort, urge to cough, aphonia, dysphagia, stridor or complete airway obstruction. Examination may reveal laryngeal edema or more likely a purple vascular mass lesion. The lesion's surface can appear verrucous in nature, due to deposits of dry secretion [62]. The diagnosis can be established by laryngoscopy or radiologic studies. A CT scan of the larynx may help delineate laryngeal mass lesions. While a diagnostic biopsy in several patients was performed without complications, biopsy of such vascular laryngeal lesions has been associated with brisk and potentially fatal bleeding [65].

Therapeutic options for this scenario include low-dose local irradiation, intralesional chemotherapy or laser ablation, and systemic therapy, particularly if there is disseminated KS. For laryngeal KS lesions producing acute or impending airway obstruction urgent intervention is necessary. However, depending on the location of the KS lesion, tracheostomy may contribute to mortality as a result of fatal hemorrhage [66]. Therefore, cricothyrotomy has been recommended by some authors as an alternative approach to life-threatening emergencies in this setting.

Eye

Periorbital edema may occur with KS of the face [75,76]. External ocular KS lesions are also not uncommon. KS of the conjunctiva and ocular adnexa has been reported in association with Classic and AIDS-related KS [77-87]. Iso-

lated bulbar conjunctival and eyelid KS has been noted [88,89]. In a study of 6,552 AIDS patients from Buenos Aires in Argentina, ocular KS was diagnosed in 17 (0.25%) individuals [90]. Lesions in this study predominated in eyelids, most with the inferior eyelid affected. A similar study from Zaire in Africa (1962 – 1991) reported on 11 patients with ocular adnexal KS, representing an incidence of 1.25 for 10,000 cases [91]. In this study, 9 of the patients had AIDS. It has been previously pointed out that ocular KS may be the first manifestation of HIV infection [85].

External ocular KS may manifest as a mass lesion or simply as a subconjunctival hemorrhage. Interestingly, increased sludging of conjunctival blood-flow has been shown in patients with KS [92]. Epiphora (overflow of tears) due to KS of the nasolacrimal duct has been seen [93]. Far less common, KS may involve the internal structures of the eye. In one case with widely disseminated KS, tumor involving the choroid of both eyes was identified at autopsy [46]. A case of widely disseminated AIDS-associated KS localized in the patient's orbit has been previously described [94]. Despite intensive chemotherapy, progression in this patient was aggressive with a fatal outcome. While regression of conjunctival KS has been documented in some cases [95], so to has recurrence following surgical treatment and cryotherapy of ocular adnexal KS in AIDS patients [80].

Major salivary glands

KS can involve the parenchyma and/or intraparenchymal lymph nodes of the major salivary glands [96]. Both the submandibular and parotid glands have been involved. The parotid is the only salivary gland with substantial lymphoid tissue. This explains why most case reports of KS were of intraparotid lymph nodes, particularly in the setting of AIDS [97-99]. Excluding intraparotid lymph node involvement, around 10 cases have been reported in which KS was identified infiltrating the acinar tissue of major salivary glands [100-103]. Patients with KS of their salivary glands have been reported to present clinically for evaluation primarily because of a 1 cm to 4 cm mass or swelling of the major salivary gland that was present from 1 to 70 months [103]. Findings of HHV8 DNA in saliva prompted investigators to study the presence of this virus in several salivary gland neoplasms [104]. They found that HHV8 does not appear to infect the salivary gland in HIV-seronegative patients, nor does it not seem to play a pathogenic role in non-KS vascular and epithelial salivary gland neoplasms.

Endocrine glands

1. Adrenal gland

Very few detailed case reports of adrenal KS have been published, mostly in patients with AIDS [105,106]. Adrenal KS has been documented in post-mortem studies in 19% of examined patients with Classic (sporadic), 18% with African (endemic), and 17% with AIDS-related (epidemic) KS [8]. The adrenal cortex appears to be involved far more frequently than the medulla [60].

2. Thyroid gland

Involvement of the thyroid gland by KS is exceedingly rare, and presently only 5 cases have been reported [53,107-111]. In 2 cases the diagnosis was made at autopsy. In the other patients, the diagnosis was established by FNA. Patients have presented with a slowly enlarging asymptomatic thyroid nodule [111], as well as hypothyroidism in one case due to actual destruction of the thyroid gland by KS [108].

3. Pituitary gland

No report of KS involving the pituitary was found. In particular, KS of the pituitary gland was not identified in a series of 49 autopsied patients with AIDS in which the pituitary gland was specifically studied [112].

Heart

Cardiac involvement has been reported in the various epidemiologic forms of KS. The results of autopsy studies conducted from 1959–1986 identified KS of the heart in 18% of African (endemic), 17% in AIDS-related (epidemic), and 15% of Classic (sporadic) KS [8]. Cardiac dysfunction directly due to KS involvement has not been noted [8]. In Classic KS, heart involvement has been reported to occur more likely in patients without cutaneous disease [107,113]. Surprisingly, primary cardiac KS has been found in a Haitian woman with AIDS [114]. The epicardium (subepicardial adipose tissue) appears to be more commonly involved than the myocardium or endocardium [8,115-117].

Thoracic duct

Chylothorax is a known, but rare manifestation of KS involving the thoracic duct and adjacent mediastinal structures [118-123]. KS related chylothoraces frequently develop with concomitant upper airway KS disease [122]. Interestingly, a case of chylous ascites caused by KS has been previously documented [124]. Although KS-related chylothorax formation was initially postulated to develop due to metastatic KS to the thoracic duct [118], more recent findings suggest that this may arise due to development of in-situ KS in this region [123].

Urinary System

Genital KS lesions are common. Infrequently, urethral meatal lesions may cause outlet obstruction and urinary retention [125,126]. However, KS of the urinary system has only been rarely reported, despite the fact that HHV8 is shed in urine from infected patients [127]. There have

been three accounts of KS of the urinary bladder [128-130]. Interestingly, all three patients were renal transplant recipients. In one patient KS involved a transplanted kidney, ureter and urinary bladder [129].

Breast

Since HHV8 can be detected in breast milk [131], it is not unexpected that KS may arise within mammary tissue. KS development on lymphedematous arms following radical mastectomy has been reported in two patients [132,133]. KS within the breast may involve breast parenchyma or intramammary lymph nodes [134]. There have been three cases reported of mammary KS [135-137]. Breast involvement has been reported without evidence of KS disease elsewhere, and also in the setting of disseminated cutaneous KS. KS can present as a small deep palpable mass or as a cutaneous lesion. KS axillary lymphatic involvement in one HIV infected patient produced lymphatic obstruction, causing a peau d'orange appearance of the breast [136].

Wounds

Localization of KS to sites of previous iatrogenic trauma has been documented [138,139], several with underlying immunosuppression [140]. One publication describes oral KS arising after minor surgery in a transplant patient [141]. KS in this particular case developed soon (within 6 days) after the patient's trauma. A similar case of KS occurring de novo in the surgical scar of a heart transplant recipient has been published [142]. A case of primary intraosseous KS developed in the tibia of an HIV-negative 20-year-old man at the exact same site of a prior traumatic bone injury and operative scar [20]. Another osseous lesion in the mandible of a 52-year-old man with AIDS arose in the area of previously extracted teeth [23]. Moreover, there have been cases noted of KS arising in tissue grafts [143,144]. Around 10 cases of KS associated with pemphigus lesions have been described, mainly with pemphigus vulgaris and less commonly foliaceus and erythematosus variants [145,146]. KS occurring in a dermatome previously involved by herpes zoster has been shown [147], as well as primary KS due to prior radiation [148].

Blood clots

A case of transplant-related KS restricted to the site of a previous deep venous thrombosis has been documented [149]. This 72-year-old male patient with a renal transplant had received immunosuppressant drugs including sirolimus, mycophenolate mofetil, tacrolimus and steroids. His KS developed 11 months after transplantation, in relation to deep venous thrombosis and withdrawal of sirolimus due to toxicity. Progressive withdrawal of prednisone was accompanied by full remission of this patient's KS.

Conclusion

It is clear from the aforementioned review that KS has been reported in virtually all anatomic sites. KS involvement of other unusual sites not discussed in this chapter include the gonads (e.g. testis) [150], endometrium [46], and external auditory meatus [151]. The rarity of KS reports in uncommon regions may be due be to underreporting, asymptomatic lesions, declining number of current autopsies being performed, and/or under recognition of signs by health care providers. Many of these patients were reported to have AIDS in the pre-HAART era (<1996), with widely disseminated disease. While KS has been documented in infants as young as 6-days-old [152], KS of the placenta does not appear to have yet been reported.

As a result of HIV, a significant increase in anatomically disseminated KS cases was evident. The anatomical distribution of KS lesions also changed during the AIDS period. Soon after the onset of the AIDS epidemic, head and neck AIDS-related KS became one of the most common manifestations of AIDS [153]. In a study involving Tanzanian children, investigators noted that in approximately 12% of children KS appeared in anatomical sites that were usually not involved in cases of the pre-AIDS period, viz. the eyelid, ear, lip, face and genitalia [154]. Furthermore, researchers also reported a significant increase in upper limb cases and a decrease in lower limb and lymph node involvement [154]. The manifestations of KS have also changed considerably with the advent of HAART. As a result of HAART, a smaller proportion of KS patients appear to present with visceral disease [155]. In particular, gastrointestinal tract and pulmonary involvement are less frequent among KS-HAART patients [155]. The frequency of mucosal and lymph node involvement do not appear to be appreciably altered by HAART [155].

The occurrence of KS in any of these atypical sites may prove difficult to diagnose, particularly if patients are asymptomatic, lesions go unrecognized on routine imaging studies (e.g. osseous KS on plain x-ray films), and/or clinician's are unwary of their existence [156]. Awareness that KS can occur in any of these unusual locations may avoid potential misdiagnosis with serious consequences (e.g. spinal cord compression) and/or mismanagement (e.g. biopsy of laryngeal KS with subsequent life-threatening hemorrhage). Also, the possibility of occult HIV infection should be entertained in a young person with an unusual clinical presentation (e.g. subconjunctival hemorrhage), as KS may mimic common lesions and represent the initial presenting sign of AIDS.

In several cases, there was limited available clinical data. Pathologic verification of a diagnosis of KS by means of biopsy and/or autopsy was not available in some cases. In

their review of 66 cases of reported osseous KS, the authors noted that histological proof of actual bone involvement by KS was only obtained in 53% of cases [9]. Very rarely was HHV8 demonstrated within any of these lesions. Therefore, it is plausible that some published cases may not truly represent KS. KS involvement of infrequent sites may not be considered in the differential diagnoses. In HIV infected persons, for example, brain lesions and salivary gland enlargement are frequently identified and more likely to be attributed to other non-KS causes. Hence, in the setting of HIV/AIDS, it is important to always consider KS in the differential diagnosis.

It is interesting to hypothesize why KS is rarely encountered in the aforementioned anatomic locations. Moreover, why KS involvement of sites like the bladder and breast are uncommon when HHV8 is shed in urine and breast milk, respectively, from infected patients is intriguing. A urinary protein called ANUP (antineoplastic urinary protein) has certainly been shown to inhibit KS growth in a murine model [157]. Conversely, investigators have shown that nerve growth factor, possibly related to HHV8 infection, may be involved in KS progression [158]. Moreover, KS cells secrete a neurotrophic growth factor [159]. One would expect these findings to support more frequent KS involvement of neural tissue.

It is also unclear if isolated KS lesions in some of these sites represent primary or disseminated disease. Some authors have considered the occurrence of KS in unusual locations to represent metastatic disease [54,160]. Alternatively, KS may arise in numerous sites via multicentric development. It is widely believed that since the eyes and brain are relatively devoid of lymphatic endothelium, these organs are unlikely to be sources of primary KS if KS tumor cells are indeed derived from lymphatic endothelium [160-162]. Direct histological evidence of the development of early (in-situ) KS from lymphatic vessels in the setting of chronic lymphedema has been shown [123].

KS lesions develop as a result of the following combination of factors: HHV8, altered immunity (immunosuppression), and an inflammatory/angiogenic milieu. This may explain why, in the appropriate clinical setting, KS develops in traumatized tissue or pemphigus lesions [145]. Some authors believe that post-traumatic KS lesions represent the Koebner phenomenon (the appearance of a skin lesion as a result of trauma) [141,147]. The Koebner phenomenon has been reported by several authors to develop in Classic, AIDS-related and transplant-associated KS [163,164]. Although still controversial, pemphigus has been associated with HHV8 [165]. Trauma may precipitate inflammatory changes that recruit HHV8 to the injured site. Finally, specific inflammatory cytokines like interleukin-6, shown to be increased in both serum and blister fluid of pemphigus patients [166], are essential for KS tumorigenesis.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LP and BJD contributed equally to all aspects of this paper.

References

1. Meyer-Rochow GY, Lee KM, Smeeton IW, Shaw JH: **Primary Kaposi sarcoma of the appendix: a rare cause of appendicitis.** *ANZ J Surg* 2007, **77:**402-3.
2. Elizalde JI, Escorsell A, García-Pugés A, Navarro S, Bataller R, Terés J: **Isolated rectal Kaposi sarcoma (article in Spanish).** *Rev Esp Enferm Dig* 1993, **84:**399-401.
3. Aprosio N, Batzenschlager A, Hamid M, Aprosio C, Manunta A, Debrosses A, Camilleri G: **Kaposi disease with mesenteric localization (article in French).** *Presse Med* 1984, **13:**504.
4. Pantanowitz L, Dezube BJ: **Bone lesions in Kaposi sarcoma (editorial).** *AIDS Read* 2007, **17:**204.
5. Kaposi M: **Classics in oncology. Idiopathic multiple pigmented sarcoma of the skin.** *CA Cancer J Clin* 1982, **32:**342-347.
6. Kaminer B, Murray JF: **Sarcoma idiopathicum multiplex haemorrhagicum of Kaposi, with special reference to its incidence in the South African Negro, and two case reports.** *S Afr J Clin Sci* 1950, **1:**1-25.
7. Kyalwazi SK: **Kaposi sarcoma: clinical features, experience in Uganda.** *Antibiot Chemother* 1981, **29:**59-69.
8. Harawi SJ: **Kaposi sarcoma. In Pathology and pathophysiology of AIDS and HIV-related diseases.** Edited by: Harawi SJ, O'Hara CJ. CV Mosby Company, St Louis; 1989:83-133.
9. Caponetti G, Dezube BJ, Restrepo CS, Pantanowitz L: **Kaposi sarcoma of the musculoskeletal system. A review of 66 patients.** *Cancer* 2007, **109:**1040-52.
10. Haddow LJ, Davies S, Buckingham S, Miller RF: **Kaposi sarcoma infiltrating skeletal muscle.** *Sex Transm Infect* 2002, **78:**464-5.
11. Restrepo CS, Lemos DF, Gordillo H, Odero R, Varghese T, Tiemann W, Rivas FF, Moncada R, Gimenez CR: **Imaging findings in musculoskeletal complications of AIDS.** *Radiographics* 2004, **24:**1029-49.
12. Ficarra G, Berson AM, Silverman S Jr, Quivey JM, Lozada-Nur F, Sooy DD, Migliorati CA: **Kaposi sarcoma of the oral cavity: a study of 134 patients with a review of the pathogenesis, epidemiology, clinical aspects, and treatment.** *Oral Surg Oral Med Oral Pathol* 1988, **66:**543-50.
13. The BS, Lu HH, Lynch GR, Banez E, Kroll MH: **AIDS-related Kaposi sarcoma involving bone and bone marrow.** *South Med J* 1999, **92:**61-4.
14. Levin M, Hertzberg L: **Kaposi sarcoma of the bone marrow presenting with fever of unknown origin.** *Med Pediatr Oncol* 1994, **22:**410-3.
15. Trattner A, David M, Sandbank M: **Kaposi sarcoma involvement of the bone marrow.** *Am J Med Sci* 1992, **303:**1.
16. Conran RM, Granger E, Reddy VB: **Kaposi sarcoma of the bone marrow.** *Arch Pathol Lab Med* 1986, **110:**1083-5.
17. Steinbach LS, Tehranzadeh J, Fleckenstein JL, Vanarthos WJ, Pais MJ: **Human immunodeficiency virus infection: musculoskeletal manifestations.** *Radiology* 1993, **186:**833-838.
18. Pitson GA, Aw TJ, Rodger A: **Classical Kaposi sarcoma involving bone.** *Australas Radiol* 1999, **43:**391-3.
19. Martinez-Sapina MJ, Mosquera J, Castro JM, Comesana ML, Rodríguez E, Menendez MD: **Kaposi sarcoma involving bone in an HIV negative patient.** *Eur J Radiol* 1992, **15:**200-2.
20. Chen HH, Jung YC, Chen TY, Leung HW: **Non-AIDS-related primary intraosseous Kaposi sarcoma: case report and literature review.** *Acta Oncol* 1997, **36:**224-7.
21. Nguyen C, Lander P, Begin LR, Jarzem P, Grad R: **AIDS-related Kaposi sarcoma involving the tarsal bones.** *Skeletal Radiol* 1996, **25:**100-2.

22. Moosa MR: **Kaposi sarcoma in kidney transplant recipients: a 23-year experience.** *QJM* 2005, **98(3):**205-14.
23. Langford A, Pohle HD, Reichart P: **Primary intraosseous AIDS-associated Kaposi sarcoma. Report of two cases with initial jaw involvement.** *Int J oral Maxillofac Surg* 1991, **20:**366-368.
24. Fliss DM, Parikh J, Freeman JL: **AIDS-related Kaposi sarcoma of the sphenoid sinus.** *J Otolaryngol* 1992, **21:**235-237.
25. Righi P, Pierleoni L, Ficarra G: **Bone involvement of the jaws in AIDS-related Kaposi sarcoma.** *Minerva Stomatol* 1994, **43:**521-524.
26. Turner L, Saveuse H, Rouveix E: **Lytic vertebral lesions in a patient with AIDS: a new case of Kaposi sarcoma involving bones.** *J Rheumatol* 1997, **24:**2054-5.
27. Isenbarger DW, Aronson NE: **Lytic vertebral lesions: an unusual manifestation of AIDS-associated Kaposi sarcoma.** *Clin Infect Dis* 1994, **19:**751-5.
28. Nichols CM, Flaitz CM, Hicks MJ: **Primary intraosseous Kaposi sarcoma of the maxilla in human immunodeficiency virus infection: review of literature and report of case.** *J Oral Maxillofac Surg* 1995, **53:**325-9.
29. Kleinegger CL, Sarubin D: **Intraoral Kaposi sarcoma associated with alveolar bone erosion.** *Miss Dent Assoc J* 1996, **52:**14-5.
30. Lausten LL, Ferguson BL, Barker BF, Cobb CM: **Oral Kaposi sarcoma associated with severe alveolar bone loss: case report and review of the literature.** *J Periodontol* 2003, **74:**1668-75.
31. Krishna G, Chitkara RK: **Osseous Kaposi sarcoma.** *JAMA* 2003, **289:**1106.
32. Thanos L, Mylona S, Kalioras V, Pomoni M, Batakis N: **Osseous Kaposi sarcoma in an HIV-positive patient.** *Skeletal Radiol* 2004, **33:**241-3.
33. Hallet Y, Van Overschelde J: **An unusual localization and presentation of Kaposi sarcoma.** *Acta Orthop Belg* 1999, **65:**109-112.
34. van Twillert G, van Eeden S, Nellen FJB, Cornelissen M, Wszolek Z, Westermann AM: **Spinal cord compression due to Kaposi sarcoma.** *Ann Oncol* 2004, **15:**1143-4.
35. Wszolek AK, Bashir RM, Lorenzo AS, Egan JD: **Kaposi sarcoma as a cause of spinal cord compression in an immunocompromised patient.** *South Med J* 1990, **83:**723-4.
36. Bhandari M, Aziz M, Kempin S: **AIDS-related osseous Kaposi sarcoma.** *The AIDS Reader* 2007, **17:**202-5.
37. Omeis I, Siems AL, Harrington W, Johnson LS, Destian S, DeMattia JA: **Spinal Kaposi sarcoma presenting without cutaneous manifestations. Case report.** *J Neurosurg Spine* 2007, **7:**558-61.
38. Meyers SA, Kuhlman JE, Fishman EK: **Kaposi sarcoma involving bone: CT demonstration in a patient with AIDS.** *J Comput Assist Tomogr* 1990, **14:**161-2.
39. Horusitzky A, Cariou D, Chicheportiche V, Brice P, Aerts J, Ziza JM, Raguin G: **Kaposi sarcoma involving bone in a patient with AIDS.** *AIDS* 1995, **9:**206-8.
40. Jaimovich L, Jaimovich CB, Suarez Anzorena P: **Bone lesions in Kaposi angiogenous reticulosis.** *Med Cutan Ibero Lat Am* 1977, **5:**205-11.
41. Baron AL, Steinbach LS, LeBoit PE, Mills CM, Gee JH, Berger TG: **Osteolytic lesions and bacillary angiomatosis in HIV infection: radiologic differentiation from AIDS-related Kaposi sarcoma.** *Radiology* 1990, **177:**77-81.
42. Simon F, Chouc P-Y, Chouc-Larriviere C, Normand P, Jeandel P: **Les atteintes osseuses au cours du sarcome de Kaposi endemique africain a propos d'une observation.** *Med Trop* 1997, **57:**174-6.
43. Konstantinopoulos PA, Goldsztein H, Dezube BJ, Pantanowitz L: **Acquired immunodeficiency syndrome related Kaposi sarcoma eroding the maxillary bone.** *J Laryngol Otol* 2007:1-5.
44. Michaels L, Soucek S, Liang J: **The ear in the acquired immunodeficiency syndrome: I. Temporal bone histopathologic study.** *Am J Otol* 1994, **15:**515-22.
45. Lothe F: **Kaposi sarcoma in Uganda Africans.** *Acta Pathol Microbiol Scand Suppl* 1963:1.
46. Gonzalez-Crussi F, Mossanen A, Robertson DM: **Neurological involvement in Kaposi sarcoma.** *Can Med Assoc J* 1969, **100:**481-4.
47. Nesbitt S, Mark PF, Zimmrman HM: **Disseminated visceral idiopathic hemorrhagic sarcoma (Kaposi disease) – report of case with necropsy findings.** *Ann Inters Med* 1943, **22:**601-5.
48. Schirren CG, Burkhardt L: **Ein sarcoma idiopathicum multiplex haemorrhagicum (Kaposi) mit hirnmetastasen.** *Arch Klin Exp Dermatol* 1955, **201:**99-105.
49. Loring WE, Wolman SR: **Idiopathic multiple hemorrhagic sarcoma of lung (Kaposi sarcoma).** *N Y State J Med* 1965, **64:**668-676.
50. Rwomushana RJ, Bailey IC, Kyalwazi SK: **Kaposi sarcoma of the brain. A case report with necropsy findings.** *Cancer* 1975, **36:**1127-31.
51. Kelly WM, Brant-Zawadzki M: **Acquired immunodeficiency syndrome: neuroradiologic findings.** *Radiology* 1983, **149:**485-91.
52. Barton NW, Safai B, Nielsen SL, Posner JB: **Neurological complications of Kaposi sarcomat. An analysis of 5 cases and a review of the literature.** *J Neurooncol* 1983, **1:**333-46.
53. Welch K, Finkbeiner W, Alpers CE, Blumenfeld W, Davis RL, Smuckler EA, Beckstead JH: **Autopsy findings in the acquired immune deficiency syndrome.** *JAMA* 1984, **252:**1152-9.
54. Gorin FA, Bale JF Jr, Halks-Miller M, Schwartz RA: **Kaposi sarcoma metastatic to the CNS.** *Arch Neurol* 1985, **42:**162-5.
55. Post MJ, Sheldon JJ, Hensley GT, Soila K, Tobias JA, Chan JC, Quencer RM, Moskowitz LB: **Central nervous system disease in acquired immunodeficiency syndrome: prospective correlation using CT, MR imaging, and pathologic studies.** *Radiology* 1986, **158:**141-8.
56. Uldry PA, Steck AJ, Regli F, Deruaz JP, Chave JP, Glauser MP: **Neurologic complications accompanying acquired immunodeficiency syndrome (AIDS): study of a group of 8 cases (article in French).** *Schweiz Med Wochenschr* 1987, **117:**560-9.
57. Ariza A, Kim JH: **Kaposi sarcoma of the dura mater.** *Hum Pathol* 1988, **19:**1461-3.
58. Bahat E, Akman S, Karpuzoglu G, Aktan S, Ucar T, Arslan AG, Nenonen N, Guven AG, Karpuzoglu T: **Visceral Kaposi sarcoma with intracranial metastasis: a rare complication of renal transplantation.** *Pediatr Transplant* 2002, **6:**505-8.
59. Buell JF, Gross T, Alloway RR, Trofe J, Woodle ES: **Central nervous system tumors in donors: misdiagnosis carries a high morbidity and mortality.** *Transplant Proc* 2005, **37:**583-4.
60. Templeton AC: **Pathology.** In *Kaposi sarcoma. Pathophysiology and clinical management* Edited by: Ziegler JL, Dorfman RF. Arcel Dekker, Inc., New York; 1988:23-70.
61. Wall SD: **Radiologic features.** In *Kaposi sarcoma. Pathophysiology and clinical management* Edited by: Ziegler JL, Dorfman RF. Marcel Decker, Inc. New York; 1988:189-235.
62. Weidauer H, Tilgen W, Adler D: **Kaposi sarcoma of the larynx (article in German).** *Laryngol Rhinol Otol (Stuttg)* 1986, **65:**389-91.
63. Levy FE, Tansek KM: **AIDS-associated Kaposi sarcoma of the larynx.** *Ear Nose Throat J* 1990, **69:**177. 182–4
64. Roy TM, Dow FT, Puthuff DL: **Upper airway obstruction from AIDS-related Kaposi sarcoma.** *J Emerg Med* 1991, **9:**23-5.
65. Mochloulis G, Irving RM, Grant HR, Miller RF: **Laryngeal Kaposi sarcoma in patients with AIDS.** *J Laryngol Otol* 1996, **110:**1034-7.
66. Beitler AJ, Ptaszynski K, Karpel JP: **Upper airway obstruction in a woman with AIDS-related laryngeal Kaposi sarcoma.** *Chest* 1996, **109:**836-7.
67. Schiff NF, Annino DJ, Woo P, Shapshay SM: **Kaposi sarcoma of the larynx.** *Ann Otol Rhinol Laryngol* 1997, **106:**563-7.
68. Tami TA, Ferlito A, Rinaldo A, Lee KC, Singh B: **Laryngeal pathology in the acquired immunodeficiency syndrome: diagnostic and therapeutic dilemmas.** *Ann Otol Rhinol Laryngol* 1999, **108:**214-20.
69. Gras R, Moulin G, Giovanni A, Chagnaud C, Triglia JM, Zanaret M: **Intralesional injection of vinblastine in treatment of laryngeal Kaposi sarcoma associated with AIDS (article in French).** *Ann Otolaryngol Chir Cervicofac* 1999, **116:**291-4.
70. Alkhuja S, Menkel R, Patel B, Ibrahimbacha A: **Stridor and difficult airway in an AIDS patient.** *AIDS Patient Care STDS* 2001, **15:**293-5.
71. Ares C, Allal AS: **Long-term complete remission of laryngeal Kaposi sarcoma after palliative radiotherapy.** *Nat Clin Pract Oncol* 2005, **2:**473-7.
72. Angouridakis N, Constantinidis J, Karkavelas G, Vlachtsis K, Mpouras K, Daniilidis J: **Classic (Mediterranean) Kaposi sarcoma of the true vocal cord: a case report and review of the literature.** *Eur Arch Otorhinolaryngol* 2006, **263:**537-40.
73. Pantanowitz L, Dezube BJ: **Kaposi sarcoma of the larynx.** *AIDS Read* 2006, **16:**194-5.

74. Ashurov ZM, Mustafaev DM, Sivkovich OO, Akhmedov IN: **Kaposi sarcoma of the larynx in a patient with a negative test for AIDS (article in Russian).** *Vestn Otorinolaringol* 2007, **5:**79-80.
75. Zidar BL: **Images in clinical medicine. Periorbital edema in Kaposi sarcoma.** *N Engl J Med* 1995, **332:**1204.
76. Harrison M, Tomlinson D, Stewart S: **Periorbital edema in Kaposi sarcoma.** *N Engl J Med* 1995, **333:**799-800.
77. Koscard E: **Kaposi sarcoma in a Chinese boy (aged 16 years) with localisation on the left lower extremity and on the right caruncula lacrimalis.** *Dermatologica* 1949, **99:**43-8.
78. Alexander CM: **Kaposi sarcoma with ocular manifestations.** *Am J Ophthalmol* 1963, **55:**625-8.
79. Weiter JJ, Jakobiec FA, Iwamoto T: **The clinical and morphologic characteristics of Kaposi sarcomas of the conjunctiva.** *Am J Ophthalmol* 1980, **89:**546-52.
80. Dugel PU, Gill PS, Frangieh GT, Rao NA: **Treatment of ocular adnexal Kaposi sarcoma in acquired immune deficiency syndrome.** *Ophthalmology* 1992, **99:**1127-32.
81. Ugen KE, McCallus DE, Van Feldt JM, Williams WV, Greene WI, Weiner DB: **Ocular tissue involvement in HIV infection: immunological and pathological aspects.** *Immunol Res* 1992, **11:**141-153.
82. Ron IG, Kremer I, Lowenstein A, Chaitchik S: **Conjunctival involvement in classic (indolent) HIV negative Kaposi sarcoma.** *Br J Ophthalmol* 1994, **78:**488-9.
83. Kurumety UR, Lustbader JM: **Kaposi sarcoma of the bulbar conjunctiva as an initial clinical manifestation of acquired immunodeficiency syndrome.** *Arch Ophthalmol* 1995, **113:**978.
84. Brun SC, Jakobiec FA: **Kaposi sarcoma of the ocular adnexa.** *Int Ophthalmol Clin* 1997, **37:**25-38.
85. Curtis TH, Durairaj VD: **Conjunctival Kaposi sarcoma as the initial presentation of human immunodeficiency virus infection.** *Ophthal Plast Reconstr Surg* 2005, **21:**314-5.
86. Minoda H, Usui N, Sata T, Katano H, Serizawa H, Okada S: **Human herpesvirus-8 in Kaposi sarcoma of the conjunctiva in a patient with AIDS.** *Jpn J Ophthalmol* 2006, **50:**7-11.
87. Reiser BJ, Mok A, Kukes G, Kim JW: **Non-AIDS-related Kaposi sarcoma involving the tarsal conjunctiva and eyelid margin.** *Arch Ophthalmol* 2007, **125:**838-40.
88. Murray N, McCluskey P, Wakefield D, Beaumont P: **Isolated bulbar conjunctival Kaposi sarcoma.** *Aust N Z J Ophthalmol* 1994, **22:**81-2.
89. Dammacco R, Lapenna L, Giancipoli G, Piscitelli D, Sborgia C: **Solitary eyelid Kaposi sarcoma in an HIV-negative patient.** *Cornea* 2006, **25:**490-2.
90. Corti M, Solari R, de Carolis L, Corraro R: **Eye involvement in AIDS-related Kaposi sarcoma (article in Spanish).** *Enferm Infecc Microbiol Clin* 2001, **19:**3-6.
91. Kaimbo Wa, Kaimbo K: **Kaposi sarcoma with ocular location in Zaire (article in French).** *Bull Soc Belge Ophtalmol* 1994, **254:**117-21.
92. Baumannm S, Geierm SA, Thoma-Gerberm E, Noehlm MA, Klaussm V, Goebelm FD: **Human immunodeficiency virus-related microvasculopathy and Kaposi sarcoma: a case-control study.** *Ger J Ophthalmol* 1995, **4:**239-45.
93. Khanm MA, Dhillonm B: **Epiphora due to Kaposi sarcoma of the nasolacrimal duct.** *Br J Ophthalmol* 1999, **83:**501-2.
94. Collaçom L, Gonçalvesm M, Gomes L, Miranda R: **Orbital Kaposi sarcoma in acquired immunodeficiency syndrome.** *Eur J Ophthalmol* 2000, **10:**88-90.
95. Mortada A: **Conjunctival regressing Kaposi sarcoma.** *Br J Ophthalmol* 1967, **51:**275-80.
96. Pantanowitz L, Dezube BJ: **Kaposi sarcoma.** *Ear Nose Throat J* 2004, **83:**157.
97. Puxeddu R, Parodo G, Locci F, Puxeddu I, Manconi PE, Ferreli C: **Parotid mass as an early sign of Kaposi sarcoma associated with human herpesvirus 8 infection.** *J Laryngol Otol* 2002, **116:**470-3.
98. Rizos E, Drosos AA, Ioannidis JP: **Isolated intraparotid Kaposi sarcoma in human immunodeficiency virus type 1 infection.** *Mayo Clin Proc* 2003, **78:**1561-3.
99. Steele NP, Sampogna D, Sessions RB: **Kaposi sarcoma of an intraparotid lymph node leading to a diagnosis of HIV.** *Laryngoscope* 2005, **115:**861-3.
100. Finfer MD, Schinella RA, Rothstein SG, Persky MS: **Cystic parotid lesions in patients at risk for the acquired immunodeficiency syndrome.** *Arch Otolaryngol Head Neck Surg* 1988, **114:**1290-4.
101. Yeh CK, Fox PC, Fox CH, Travis WD, Lane HC, Baum BJ: **Kaposi sarcoma of the parotid gland in acquired immunodeficiency syndrome.** *Oral Surg Oral Med Oral Pathol* 1989, **67:**308-12.
102. Mukherjee A, Silver CE, Rosario PG, Gerst PH: **Kaposi sarcoma of the parotid gland in acquired immunodeficiency syndrome.** *Am Surg* 1998, **64:**259-60.
103. Castle JT, Thompson LD: **Kaposi sarcoma of major salivary gland origin: A clinicopathologic series of six cases.** *Cancer* 2000, **88:**15-23.
104. Klussmann JP, Müller A, Wagner M, Guntinas-Lichius O, Jungehuelsing M, Sloots T, Ablashi DV, Krueger GR: **Human herpesvirus type 8 in salivary gland tumors.** *J Clin Virol* 2000, **16:**239-46.
105. Glasgow BJ, Steinsapir KD, Anders K, Layfield LJ: **Adrenal pathology in the acquired immune deficiency syndrome.** *Am J Clin Pathol* 1985, **84:**594-7.
106. Lazure T, Plantier F, Alsamad IA, Cabanis P, Malaury E, Blondeau JR: **Bilateral adrenal Kaposi sarcoma in an HIV seronegative patient.** *J Urol* 2001, **166:**1822-3.
107. Cox FH, Helwig EB: **Kaposi sarcoma.** *Cancer* 1959, **12:**289-98.
108. Mollison LC, Mijch A, McBride G, Dwyer B: **Hypothyroidism due to destruction of the thyroid by Kaposi sarcoma.** *Rev Infect Dis* 1991, **13:**826-7.
109. Gamborino E, Carrilho C, Ferro J, Khan MS, Garcia C, Suarez MC, Yokoyama H, Schmitt FC: **Fine-needle aspiration diagnosis of Kaposi sarcoma in a developing country.** *Diagn Cytopathol* 2000, **23:**322-5.
110. Zhang X, el-Sahrigy D, Elhosseiny A, Melamed MR: **Simultaneous cytomegalovirus infection and Kaposi sarcoma of the thyroid diagnosed by fine needle aspiration in an AIDS patient. A case report and first cytologic description of the two entities occurring together.** *Acta Cytol* 2003, **47:**645-8.
111. Poniecka A, Ghorab Z, Arnold D, Khaled A, Ganjei-Azar P: **Kaposi sarcoma of the thyroid gland in an HIV-negative woman: a case report.** *Acta Cytol* 2007, **51:**421-3.
112. Sano T, Kovacs K, Scheithauer BW, Rosenblum MK, Petito CK, Greco CM: **Pituitary pathology in acquired immunodeficiency syndrome.** *Arch Pathol Lab Med* 1989, **113:**1066-70.
113. Anthony CW: **Visceral Kaposi sarcoma.** *Arch Pathol* 1960, **70:**740-6.
114. Autran B, Gorin I, Leibowitch M, Laroche L, Escande JP, Hewitt J, Marche C: **AIDS in a Haitian woman with cardiac Kaposi sarcoma and Whipple's disease.** *Lancet* 1983, **1:**767-8.
115. Templeton AC: **Studies in Kaposi sarcoma. Postmortem findings and disease patterns in women.** *Cancer* 1972, **30:**854-67.
116. Silver MA, Macher AM, Reichert CM, Levens DL, Parrillo JE, Longo DL, Roberts WC: **Cardiac involvement by Kaposi sarcoma in acquired immune deficiency syndrome (AIDS).** *Am J Cardiol* 1984, **53:**983-5.
117. Cammarosano C, Lewis W: **Cardiac lesions in acquired immune deficiency syndrome (AIDS).** *J Am Coll Cardiol* 1985, **5:**703-6.
118. Schulman LL, Grimes MM: **Metastatic Kaposi sarcoma and bilateral chylothorax.** *N Y State J Med* 1986, **86:**205-6.
119. Priest ER, Weiss R: **Chylothorax with Kaposi sarcoma.** *South Med J* 1991, **84:**806-7.
120. Vandenbos F, Barel R, Abbyad R, Mondain-Miton V, Dellamonica P: **Chylothorax as a complication of Kaposi sarcoma (article in French).** *Presse Med* 1998, **27:**1218.
121. Maradona JA, Carton JA, Asensi V, Rodriguez-Guardado A: **AIDS-related Kaposi sarcoma with chylothorax and pericardial involvement satisfactorily treated with liposomal doxorubicin.** *AIDS* 2002, **16:**806.
122. Marais BJ, Pienaar J, Gie RP: **Kaposi sarcoma with upper airway obstruction and bilateral chylothoraces.** *Pediatr Infect Dis J* 2003, **22:**926-8.
123. Konstantinopoulos PA, Dezube BJ, Pantanowitz L: **Morphologic and immunophenotypic evidence of in-situ Kaposi sarcoma.** *BMC Clin Pathol* 2006, **30;6:**7.
124. Bargout R, Barker D: **A curious case of ascites. Chylous ascites caused by Kaposi sarcoma.** *Postgrad Med* 2003, **113:**95-6. 112
125. John H, Pestalozzi DM, Hauri D: **Kaposi sarcoma of the glans penis with meatal obstruction. Case report and literature review (article in German).** *Swiss Surg* 1996, **3:**134-6.

126. Lebovitch S, Mydlo JH: **HIV-AIDS: urologic considerations.** *Urol Clin North Am* 2008, **35:**59-68.
127. Santos-Fortuna E, Caterino-de-Araujo A: **Confirming shedding of human herpesvirus 8 in urine from infected patients in Brazil.** *J Clin Microbiol* 2005, **43:**1008.
128. Biermann CW, Gasser TC, Rutishauser G: **Kaposi sarcoma of the urinary bladder after kidney transplantation (article in German).** *Helv Chir Acta* 1992, **59:**503-5.
129. Rha SE, Byun JY, Kim HH, Baek JH, Hwangm TK, Kangm SJ: **Kaposi sarcoma involving a transplanted kidney, ureter and urinary bladder: ultrasound and CT findings.** *Br J Radiol* 2000, **73:**1221-3.
130. Yangm CW, Parkm JH, Parkm JH, Chom SG, Kimm YS, Bangm BK: **Acute graft dysfunction due to Kaposi sarcoma involving the bladder in a renal transplant recipient.** *Nephrol Dial Transplant* 2001, **16:**625-7.
131. Brayfieldm BP, Kankasam C, Westm JT, Muyangam J, Bhatm G, Klaskalam W, Mitchellm CD, Woodm C: **Distribution of Kaposi sarcoma-associated herpesvirus/human herpesvirus 8 in maternal saliva and breast milk in Zambia: implications for transmission.** *J Infect Dis* 2004, **189:**2260-70.
132. Merimskym O, Chaitchikm S: **Kaposi sarcoma on a lymphedematous arm following radical mastectomy.** *Tumori* 1992, **78:**407-8.
133. Ronm IG, Amirm G, Marmurm S, Chaitchikm S, Inbarm MJ: **Kaposi sarcoma on a lymphedematous arm after mastectomy.** *Am J Clin Oncol* 1996, **19:**87-90.
134. Pantanowitz L, Connolly JL: **Pathology of the breast associated with HIV/AIDS.** *Breast J* 2002, **8:**234-43.
135. Osmers F, Strunk E, Clemens M, Walther B: **Kaposi sarcoma of the breast with osseous and pulmonary involvement (article in German).** *Rofo* 1978, **129:**350-2.
136. Ng CS, Taylor CB, O'Donnell PJ, Pozniak AL, Michell MJ: **Case report: mammographic and ultrasound appearances of Kaposi sarcoma of the breast.** *Clin Radiol* 1996, **51:**735-6.
137. Hamed KA, Muller KE, Nawab RA: **Kaposi sarcoma of the breast.** *AIDS Patient Care STDS* 2000, **14:**85-8.
138. Berkowitz KD, Bonner AC, Makimaa B, Flash JP, Sasken H, Blaise JF: **Trauma-induced Kaposi sarcoma of the hallux. An unusual case.** *J Am Podiatr Med Assoc* 1998, **88:**500-5.
139. Yarchoan R, Davis DA: **Development of Kaposi sarcoma at the site of a biopsy.** *N Engl J Med* 2002, **347:**763-4.
140. Gill K, Shah J: **Kaposi sarcoma in patients with diabetes and wounds.** *Adv Skin Wound Care* 2006, **19:**196-8.
141. Webster-Cyriaque J: **Development of Kaposi sarcoma in a surgical wound.** *N Engl J Med* 2002, **346:**1207-10.
142. Micali G, Gasparri O, Nasca MR, Sapuppo A: **Kaposi sarcoma occurring de novo in the surgical scar in a heart transplant recipient.** *J Am Acad Dermatol* 1992, **27:**273-4.
143. Brambilla L, Boneschi V, Fossati S, Della Bella L, Negri M: **Recurrence of Kaposi sarcoma at the site of a graft for radiodermatitis ulcer (article in Italian).** *G Ital Dermatol Venereol* 1987, **122:**655-7.
144. Brambilla L, Boneschi V, Zampieri M, Bruognolo L, Fossati S: **Persistently recurring Mediterranean Kaposi sarcoma on skin grafts.** *Int J Dermatol* 1996, **35:**362-4.
145. Pantanowitz L, Dezube BJ: **Kaposi sarcoma and pemphigus.** *J Eur Acad Dermatol Venereol* 2007, **21:**571-2.
146. Avalos-Peralta P, Herrera A, Rios-Martin JJ, Perez-Bernal AM, Moreno-Ramirez D, Camacho F: **Localized Kaposi sarcoma in a patient with pemphigus vulgaris.** *J Eur Acad Dermatol Venereol* 2006, **20:**79-83.
147. Niedt GW, Prioleau PG: **Kaposi sarcoma occurring in a dermatome previously involved by herpes zoster.** *J Am Acad Dermatol* 1988, **18:**448-51.
148. De Pasquale R, Nasca MR, Micali G: **Postirradiation primary Kaposi sarcoma of the head and neck.** *J Am Acad Dermatol* 1999, **40:**312-4.
149. González-López MA, Rodrigo E, González-Vela MC, Fernández-Llaca H, Arias-Rodríguez MA, Val-Bernal JF: **Posttransplant Kaposi sarcoma restricted to the site of a previous deep venous thrombosis: abrupt onset after withdrawal of sirolimus.** *Dermatology* 2006, **213:**30-3.
150. Kneale BJ, Bishop NL, Britton JP: **Kaposi sarcoma of the testis.** *Br J Urol* 1993, **72:**116-7.
151. Stearns MP, Hibbard AA, Patterson HC: **Kaposi Sarcoma of the ear: a case study.** *J Laryngol Otol* 1983, **97:**641-5.
152. Gutierrez-Ortega P, Hierro-Orozco S, Sanchez-Cisneros R, Montaño LF: **Kaposi sarcoma in a 6-day-old infant with human immunodeficiency virus.** *Arch Dermatol* 1989, **125:**432-3.
153. Restrepo CS, Martínez S, Lemos JA, Carrillo JA, Lemos DF, Ojeda P, Koshy P: **Imaging manifestations of Kaposi sarcoma.** *Radiographics* 2006, **26:**1169-85.
154. Amir H, Kaaya EE, Manji KP, Kwesigabo G, Biberfeld P: **Kaposi sarcoma before and during a human immunodeficiency virus epidemic in Tanzanian children.** *Pediatr Infect Dis J* 2001, **20:**518-21.
155. Nasti G, Martellotta F, Berretta M, Mena M, Fasan M, Di Perri G, Talamini R, Pagano G, Montroni M, Cinelli R, Vaccher E, D'Arminio Monforte A, Tirelli U, GICAT , ICONA : **Impact of highly active antiretroviral therapy on the presenting features and outcome of patients with acquired immunodeficiency syndrome-related Kaposi sarcoma.** *Cancer* 2003, **98:**2440-6.
156. Nguyen S, Giurca C, Melliez H, Dehecq C, Baclet V, Ajana F, Behra JM, Cotton A, Yazdanpanah Y: **Kaposi sarcoma in HIV-infected patients: when and how should we evaluate bone involvement?** *AIDS* 2007, **21:**2251-2.
157. Masood R, McGarvey ME, Zheng T, Cai J, Arora N, Smith DL, Sloane N, Gill PS: **Antineoplastic urinary protein inhibits Kaposi sarcoma and angiogenesis *in vitro* and *in vivo*.** *Blood* 1999, **93:**1038-44.
158. Pica F, Volpi A, Barillari G, Fraschetti M, Franzese O, Vullo V, Garaci E: **Detection of high nerve growth factor serum levels in AIDS-related and -unrelated Kaposi sarcoma patients.** *AIDS* 1998, **12:**2025-9.
159. Weeks BS, Cooney R: **AIDS-associated Kaposi sarcoma cells secrete a neurotrophic growth factor(s).** *Biochem Biophys Res Commun* 1997, **233:**408-12.
160. Rahman MU, Mazumder A: **Evidence supporting rare AIDS-Kaposi sarcoma metastasis In keeping with their vascular endothelial evolution.** *Cancer Cell Int* 2002, **2:**11.
161. Dorfman RF: **Kaposi sarcoma: evidence supporting its origin from the lymphatic system.** *Lymphology* 1988, **21:**45-52.
162. Douglas JL, Gustin JK, Dezube B, Pantanowitz JL, Moses AV: **Kaposi sarcoma: a model of both malignancy and chronic inflammation.** *Panminerva Med* 2007, **49:**119-38.
163. Maral T: **The Koebner phenomenon in immunosuppression-related Kaposi sarcoma.** *Ann Plast Surg* 2000, **44:**646-8.
164. Janier M, Morel P, Civatte J: **The Koebner phenomenon in AIDS-related Kaposi sarcoma.** *J Am Acad Dermatol* 1990, **22:**125-6.
165. Memar OM, Rady PL, Goldblum RM, Yen A, Tyring SK: **Human herpesvirus 8 DNA sequences in blistering skin from patients with pemphigus.** *Arch Dermatol* 1997, **133:**1247-51.
166. Lopez-Robles E, Avalos-Diaz E, Vega-Memije E, Hojyo-Tomoka T, Villalobos R, Fraire S, Domiguez-Soto L, Herrera-Esparza R: **TNFalpha and IL-6 are mediators in the blistering process of pemphigus.** *Int J Dermatol* 2001, **40:**185-8.

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