Hand's aneurysmal bone cyst: A rare localization. Case report and systematic literature review

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Abstract

Aneurysmal bone cysts are benign, rare bony tumours frequently observed among children and young adults principally located in the long bones, pelvis, and spine and rarely in other anatomical district such as the hand. We report the case of a 12-year-old girl with an aneurysmal bone cyst, in active stage, involving the still-open epiphysis of the fourth metacarpal of the right hand, which was in a first time treated by curettage, and 3 months later, occurring a recurrence, by a radically excision of the bone and reconstruction with a graft from the iliac crest. At 10-year follow-up the patient had good cosmetic results and a functioning hand. We also performed a systematic literature review in order to retrieve the key information regarding: the diagnosis, the clinical features and the treatment.

Introduction

Aneurysmal bone cysts (ABC) are benign, rare bony tumours that constitute only 1-2% of all bone tumours, described firstly by Jaffe and Lichtenstein in 1942.1 ABC can be primary or can arise from a pre-existent lesion however the etiology remains unknown. ABC are most common in the youth, principally located in the long bones, without epiphyssis involvement, pelvis and spine. The localization in other anatomical district such as the hand.2 Histologically, ABC appear as multicystic, lytic lesion with cavernous spaces stuffed with blood. The walls of cysts contain fibroblasts and thin strips of bone. The tumors are separated from the surrounding tissue by a thin layer of periosteal new bone.3 The most common treatment of an aneurysmal bone cyst is surgical curettage of the lesion, sometimes filling of the cavity with a bone graft and intraoperative adjuvant therapy may be required. Usually the prognosis following treatment is satisfactory. However, a recurrence rate was reported in the first 2 years after treatment from 10 to 59%, especially in young patients due to skeletal immaturity.4 The recurrence rate also depends on the histopathological pattern of the lesion. Preoperative staging and stage-dependent surgical procedures are essential for treatment of ABC and the risk of local recurrence is linked to aggressiveness of the primary lesion and to efficacy of the surgery. The aim of the study is to describe a case of a patient with IV metacarpal bon ABC. We also performed a systematic review of the literature in order to retrieve the key information regarding: the diagnosis, the clinical features and the treatment.

Material and Methods

Search Criteria

The study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Figure 1). A systematic review of the literature indexed in PubMed, MEDLINE, Cochrane Library and Scopus databases, using as search-terms “Aneurysmal”, “Aneurysmatic”, “bone”, “cyst”, “hand” and their MeSH terms combinations (using Boolean operator AND, OR) was performed from 1950 to March 2020. The research was repeated until March 6, 2020.

Inclusion and Exclusion Criteria

The inclusion criteria of the review were the presence in the evaluated manuscript of: demographic features, symptoms, diagnostic settings, treatment, possible complications and outcomes in patients with ABC of the hand. Only article written in English and available abstract were included. Were excluded from the review: surgical technique reports, expert opinions, studies on animals, unpublished reports, cadaver or in vitro investigations, book chapters, abstracts from scientific meetings.

Data Collection

Two independent reviewers (A.P and R.V.) separately conducted the described search by title and abstract. If the articles met inclusion criteria following a title and abstract screened, the full text was obtained and reviewed. Any discordance was solved by consensus with a third author (R.D.V.). From each included article were extracted: age and gender of the patients, location of the ABC, type of surgical treatment performed, risk factors, complications related to the treatment performed and duration of follow-up. Numbers software (Apple Inc., Cupertino, CA) was used to tabulate the obtained data.

Statistical Analysis

Categorical variables are presented as frequency and percentages. Continuous variables are presented as means and standard deviation.

Case Report

A 12-year-old girl, with history of pain in her right hand since 2 months, was visited
at our Emergency Unit. On physical examination there was a slight swelling in the dorsal region of the hand, painful to acupressure. The performed radiographs showed a cystic lesion with expanded cortical near the distal region of the fourth metacarpal, close to the still-open epiphysis (Figure 1a). A MRI was requested. Meanwhile the patient was treated in another hospital by simple surgical curettage. In following three months, she had pain and worsening of dorsal hand swelling. The radiographs and MRI showed a cystic lesion with expanded cortical involving all the fourth metacarpal, also the growth plate (Figure 2). The cortical bone was expanded and thin, which made it impossible to remove the tumour by curettage and filling the cavity with bone graft. Instead the entire diaphysis, including the tumour, was removed and a 7 cm bicortical iliac crest graft, oversizing metacarpal dimension, was harvested and fixed with Kirschner wires to the proximal phalanx and then left in place for six weeks (Figure 3). The hand was also immobilized in a short arm cast for the first 4 weeks. Follow-up radiographs showed that the bone graft healed in the correct position. Macroscopical pattern and microscopy of the tumour showed the typical features of the aneurysmal bone cyst with thin strips of bone and fibroblasts surrounded by blood vessels. At ten year follow up range of movement was satisfactory (Figure 4) only the strength in the operated hand was less than in the other hand but she didn’t have functional limitation and referred a normal life. The radiographs are shown in Figure 4.

Systematic literature review

**Patients features and demographical data**

Only a few cases of hand’s ABC were reported in the Literature. A total of 744 reports, excluding duplicates, were independently screened, thereby 40 were finally included in our review (Figure 1). Our review showed 83 cases, including our patients, of hand’s ABC in the Literature. (4-55) The mean age of included patients was 18.6 (+/- 10.6) years; 50 patients (60%) were paediatric (< of 18 years) the Male/Female ratio was 1.1; the mean follow up time was 52.1 months (+/-52.2). Demographic and clinical features are summarized in Table 1.1-51

**Symptoms onset, localization, risk factors and diagnosis**

All patients had an onset symptom. Presentation symptoms were: hand’s swelling in 70 patients (84%), hand’s pain in 60 cases (72.3%), pathologic fracture of the involved bone in one case (1.2%). In 47 cases (56.4%) pain and swelling were associated.

Hand’s ABC seems to be prevalent in the metacarpal bones (47 patients, 56.4%), followed by the proximal phalanx (19 patients, 23.8%), the middle phalanx (6 patients, 7.2%), the capitate (3 patients 3.6%), the distal phalanx (3 patients, 3.6%), the lunate (2 cases, 2.4%), the hamate (in one case 1.2%), and the trapezium (in one case 1.2%). In one case the ABC was localized in a sesamoid bone of proximal interphalangeal joint of the index. In 14 patients (16.8%) a traumatic injury of the affected hand was reported. In all case except one (98.8%) a histological diagnosis was made.

**Treatment and outcomes and complication**

Eighty-two patients (98.8%) were
surgically treated. The chosen surgical approaches were: tumour resection and autologous bone graft in 37 cases (44.4%), curettage of the lesion and autologous bone graft in 26 cases (31.2%), curettage of the cyst in 6 cases (7.2%), curettage and bipolar cauterization in 6 cases (7.2%), tumour excision in 6 cases (7.2%), amputation in 2 patients (2.4%) and conservative treatment only in one case.

Concerning surgical outcome: in 68 patients (81.6%) the first surgery was curative without signs of recurrence. Recurrence of the disease was found in 15 patients (18%), therefore they underwent reoperation. In 8 of this patients, tumour resection and autologous bone graft was used as rescue surgery. In 4 patients after recurrence a new curettage of the lesion and autologous bone graft was performed. In one patient after recurrence, cryotherapy and curettage was used as rescue surgery. In one patient the reoperation consisted in the amputation of affected finger. In one patient the reoperation consisted in curettage and bipolar cauterization of the lesion.

About complication, in 15 patients (18%) was found a limitation of range of motion (ROM); therefore, in 5 of these patients was necessary surgical debridement and tenolysis. In 3 paediatric patients (3.6%) a premature physeal closure was found.

Discussion

The origin of the term “aneurysmal bone cyst” derived from two cases of unicameral bone cysts reported by Jaffe and Lichtenstein in 1942.1 In that report, they noted two large “peculiar blood-containing cysts,” which they described as “aneurysmal bone cyst”. Jaffe argued that aneurysmal bone cysts could be the result of an hemorrhagic “blow-out” in a preexisting lesion, which may be destroyed in the process.1,2 Lichtenstein instead proposed a vascular origin, without specifying whether this lesion was a localized venous thrombosis or an congenital arteriovenous malformation.3,4 Although many hypotheses have been developed over the years, today the nature of ABC is unclear. Many authors defined aneurysmal bone cysts as a secondary evolution of a pre-existing lesion.2,3 Other authors proposed two different aetiologies characterizing the lesion as either primary or secondary to a known precursor.45 Most cases are found among children and young adults, in fact the majority of patients with aneurysmal bone cysts are younger than age 20 years. These lesions are principally located in the long bones, pelvis, and spine. Most rarely it is observed in the hand.4,19,22

The natural history of ABC is characterized by four radiologic stages: initial, active, stabilization, and healing. In the initial phase, the lesion is composed of a well-defined area of osteolysis. During the growth phase the lesion grows exponentially leading to the “destruction” of the bone and to the typical “blown-out” radiological appearance. Then follows a period of stabilization defined on the X-ray as having a “soap bubble appearance” (which is caused by the maturation of the bony shell). Final healing results in progressive calcification and ossification, with the lesion transformed into a dense bony mass.46

There has been no agreement on a definitive or ideal treatment in the entire

Figure 3. Rx pattern of reconstruction.

Figure 4. a) Rx at ten years follow up. b) Flexion of fingers at ten years follow up.
| Study          | Case | Sex | Age  | Risk Factors | Symptoms | Localization | Complication | Surgical treatment | Donor site | Outcome | Follow Up (month) |
|---------------|------|-----|------|--------------|----------|--------------|--------------|-------------------|------------|---------|------------------|
| 60        F            23                        _                             Sw                  II MTB                 ...                                          TRABG                       Iliac crest          Reoperation/Cured            18 |
| 14        F            30                        _                           P , Sw               IV MTB                  ...                       TRABG                                _                              Cured                          6 |
| 13        F            11                        _                           P , Sw                II MTB                 ...                       TRABG                               _                              Cured                         48 |
| 12        F            35                        _                           P , Sw               IV MTB                  ...                       CABG                                _                              Cured                          24 |
| 11       M           16                        _                           P , Sw                 PP I F                  ...                       Curettage                            _                              Cured                         32 |
| 10       F            13                        _                           P , Sw                PP II F                  ...                             TRABG                          Fibula                         Cured                          59 |
| 9         M           10                        _                           P , Sw               III MTB   Limitation of ROM, Recurrence          1° Curettage 2° TRABG           Fibula             Reoperation/Cured            72 |
| 8         M           20                  Trauma                     P , Sw                I MTB                      ...                              TRABG                       Iliac crest          Reoperation/Cured           125 |
| 55       M           17                        _                             Sw                  I MTB                    ...                            TRABG                          Fibula                         Cured                          98 |
| 53       M           16                        _                           P , Sw               III MTB                 Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            18 |
| 58       F           10                        _                             Sw                  II MTB                   ...                                          TRABG                          Fibula                         Cured                          18 |
| 59        M           9                         _                             Sw                  II MTB                   ...                                          TRABG                          Fibula                         Cured                          18 |
| 50        M           15                        _                           P , Sw                V MTB                   ...                                          TRABG                          Fibula                         Cured                          18 |
| 49       F           17                        _                           P , Sw               III MTB                 Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            14 |
| 48       M           16                        _                           P , Sw               IV MTB                  ...                       TRABG                                _                              Cured                          14 |
| 47       F           22                        _                           P , Sw               IV MTB                  Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            12 |
| 46       M           18                        _                           P , Sw               V MTB                   ...                                          TRABG                          Fibula                         Cured                          18 |
| 45       M           34                        _                           Sw                  Sesamoid II F              ...                             TE                               _                              Cured                          24 |
| 44       M           25                        _                           P , Sw               IV MTB                  Limitation of ROM 1° Curettage 2° Criosurgery       Iliac crest          Reoperation/Cured            60 |
| 43       M           8                          ...                             P , Sw               IV MTB                   ...                             TRABG                       Iliac crest          Reoperation/Cured            12 |
| 42       F           14                        ...                     P , Sw               PP III F     ...   Recurrence                            1° CABG 2° Criosurgery       Iliac crest          Reoperation/Cured            60 |
| 41       M           8                        ...                     P , Sw               PP I F                        ...                             TRABG                          Fibula                         Cured                          36 |
| 40       M           32                        ...                         P , Sw               I MTB                       ...                         TRABG                                _                              Cured                          18 |
| 39       F           14                        ...                     P , Sw               I MTB                       ...                         TRABG                          Fibula                         Cured                          18 |
| 38       F           40                        ...                         P , Sw               III MTB                 Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            60 |
| 36       F           11                        ...                     Sw                  MP II F                    ...                             TRABG                          Fibula                         Cured                          44 |
| 35       M           31                        ...                     P , Sw               MP III F                    ...                             TRABG                          Fibula                         Cured                          44 |
| 34       M           6                        ...                         P , Sw               PP III F                                      ...                             TRABG                          Fibula                         Cured                          44 |
| 33       F           40                        ...                     P , Sw               MP I F                        ...                             TRABG                          Fibula                         Cured                          44 |
| 32       F           10                        ...                     P , Sw               MP III F                    ...                             TRABG                          Fibula                         Cured                          44 |
| 31       F           13                        ...                         P , Sw               III MTB                       ...                         TRABG                          Fibula                         Cured                          44 |
| 30       M           11                        ...                         P , Sw               MP III F                    ...                             TRABG                          Fibula                         Cured                          44 |
| 29       M           28                        ...                         P , Sw               III MTB                 Limitation of ROM, Recurrence          1° Curettage 2° TRABG           Fibula             Reoperation/Cured            48 |
| 28       M           9                        ...                         P , Sw               DP III F                        ...                             TRABG                          Fibula                         Cured                          48 |
| 27       M           8                        ...                         P , Sw               Trapezius                  ...                             TE                               _                              Cured                          72 |
| 26       F           5                          ...                     Previous surgery CABG P, Sw              III MTB                 ...                                          TRABG                          Fibula                         Cured                          48 |
| 25       F           16                        ...                     P , Sw               IV MTB                  Recurrence                             TRABG                          Fibula                         Cured                          27 |
| 24       F           28                        ...                         P , Sw               III MTB                 ...                             TRABG                          Fibula                         Cured                          27 |
| 23       F           14                        ...                     P , Sw               IV MTB                  ...                       TRABG                                _                              Cured                          43 |
| 22       M           14                        ...                     P , Sw               I MTB                       ...                             TRABG                          Fibula                         Cured                          42 |
| 20       F           11                        ...                     P , Sw               II MTB                 ...                             TRABG                          Fibula                         Cured                          42 |
| 19       F           36                        ...                         P , Sw               V MTB                   ...                             TRABG                          Fibula                         Cured                          55 |
| 18       F           49                        ...                         P                         PP III F                      ...                                          TRABG                          Fibula                         Cured                          254 |
| 17       M           20                        ...                         P , Sw               Trapezius                  ...                             TE                               _                              Cured                          176 |
| 16       F           13                        ...                     P , Sw               PP V F                     ...                             TRABG                          Fibula                         Cured                          244 |
| 15       M           16                        ...                     Trauma P, Sw              Hamate                 ...                                          TE                               _                              Cured                          15 |
| 14       F           30                        ...                     P , Sw               IV MTB                 ...                             TRABG                          Fibula                         Cured                          _  |
| 13       F           11                        ...                     P , Sw               II MTB                 ...                             TRABG                          Fibula                         Cured                          _  |
| 12       F           35                        ...                     P , Sw               IV MTB                  ...                       CABG                                _                              Cured                          24 |
| 11       M           16                        ...                     P , Sw               PP I F                  ...                             TRABG                          Fibula                         Cured                          _  |
| 10       F           13                        ...                     P , Sw                PP II F                  ...                             TRABG                          Fibula                         Cured                          _  |
| 9         M           36                        ...                     P , Sw                III MTB                 ...                             TRABG                          Fibula                         Cured                          _  |
| 8         M           20                  Trauma                     P , Sw                I MTB                      ...                              TRABG                       Iliac crest          Reoperation/Cured           125 |
| 7         M           17                        ...                     Trauma P, Sw              DP IV F                   ...                                          Amputation                      _                              Amputation                     12 |
| 6         M           20                        ...                     Trauma P, Sw              I MTB                 ...                             TRABG                          Fibula                         Cured                          _  |
| 5         M           10                        ...                     Trauma P, Sw              III MTB                 Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            72 |
| 4         F           22                        ...                     P , Sw               IV MTB                  Limitation of ROM 1° Curettage 2° TRABG                      Fibula             Reoperation/Cured            72 |
| 3         F           9                        ...                     P                         PP I F                        ...                             TRABG                          Fibula                         Cured                          _  |
| 2         M           17                        ...                     P , Sw                III MTB                 ...                             TRABG                          Fibula                         Cured                          _  |
| 1         M           9                         ...                         P , Sw               I MTB                   ...                                          TRABG                          Fibula                         Cured                          _  |

Continued on the next page.
Conclusions

Although most authors recommend a less radical approach, a wide resection and a cortical bone graft is indicated in cases when the articular surface or growth plate is involved or when full bone invasion occurred.

References

1. Jaffe HL, Lichtenstein L. Solitary unicameral bone cyst with emphasis on the roentgen picture, the pathologic appearance, and the pathogenesis. Arch Surg 1942;44:1004-25
2. Mendenhall WM, Zioitecki RA, Gibbs CP, et al. Aneurysmal bone cyst. Am J Clin Oncocl 2006;29:311-5.
3. Vergel De Dios AM, Bond JR, Shives TC et al. Aneurysmal bone cyst. A clinicopathologic study of 238 cases. Cancer 1992;69:2921-31.
4. Freiberg AA, Loder RT, Heidelberger KP, Hensinger RN. Aneurysmal bone cysts in young children. J Pediatr Orthop 1994;14:86-91.
5. Mason ML, Wheelock MC. Aneurysmal bone cyst of the hand. J Hand Surg Am 1982;7:268-71.
6. Harto-Garofalidis G, Rigopoulos C, Fragiadakis E. Aneurysmal bone cyst of the proximal phalanx of the thumb: successful replacement by tibial autograft. A case report. Clin Orthop Relat Res 1967;15:253-61.
7. Chari PR, Rao KM. Aneurysmal bone cyst of the fourth metacarpal bone. Aust N Z J Surg 1971;41:166-9.
8. Burkhalter WE, Schroeder FC, Eversmann WW Jr. Aneurysmal bone cysts occurring in the metacarpals: a report of three cases. J Hand Surg Am 1978;3:579-84.
9. Fuhs SE, Herndon JH. Aneurysmal bone cyst involving the hand: a review and report of two cases. J Hand Surg Am 1979;4:152-9.
10. Chalmers J. Aneurysmal bone cysts of the phalanges. A report of three cases. Hand 1981;13:296-300.
11. Barbieri CH. Aneurysmal bone cyst of the hand. An unusual situation. J Hand Surg Br 1984;9:88-92.
12. Lin E, Engel J, Bubis JJ, Herman O. Aneurysmal bone cyst of the hamate bone. J Hand Surg Br 1984:9:847-50.
13. Frassica FJ, Amadio PC, Wold LE, Beabot JW. Aneurysmal bone cyst: clinicopathologic features and treatment of ten cases involving the hand. J Hand Surg Am 1988;13:676-83.
14. Kotwal PP, Jayaswal A, Singh MK, Dave PK. Aneurysmal bone cyst of the metacarpal of a child: a case report. J Hand Surg Br 1988;13:479-80.
15. Kozlowski K, Azouz EM, Campbell J et

Table 1. Continued from previous page.

| Study                  | Case  | Sex | Age (Year) | Risk Factors | Symptoms | Localization | Complication | Surgical treatment | Donor site | Outcome | Follow Up (month) |
|------------------------|-------|-----|------------|--------------|----------|--------------|--------------|-------------------|------------|---------|------------------|
| Moosallam et al. 2011  | 65 M  | 20  |            |              | P        | Capitate     |              | CABG              | Iliac crest | Cured   | 24               |
| Koseiritsky et al. 2012| 66 M  | 15  | Trauma     |              | P, Sw Ilium | MTB         |              | TRABG             | Radius     | Cured   | 144              |
| Rajappa et al. 2013    | 67 F  | 23  |            |              | P        | Lunate       |              | TE                |            | Cured   | 72               |
| Singh et al. 2013      | 68 M  | 6   |            |              | P, Sw Ilium | MTB         |              | TRABG             | Fibula     | Cured   | 24               |

References

1. Jaffe HL, Lichtenstein L. Solitary unicameral bone cyst with emphasis on the roentgen picture, the pathologic appearance, and the pathogenesis. Arch Surg 1942;44:1004-25
2. Mendenhall WM, Zioitecki RA, Gibbs CP, et al. Aneurysmal bone cyst. Am J Clin Oncocl 2006;29:311-5.
3. Vergel De Dios AM, Bond JR, Shives TC et al. Aneurysmal bone cyst. A clinicopathologic study of 238 cases. Cancer 1992;69:2921-31.
4. Freiberg AA, Loder RT, Heidelberger KP, Hensinger RN. Aneurysmal bone cysts in young children. J Pediatr Orthop 1994;14:86-91.
5. Mason ML, Wheelock MC. Aneurysmal bone cyst of the hand. J Bull Northwest Univ Sch 1958;32:268-71.
6. Harto-Garofalidis G, Rigopoulos C, Fragiadakis E. Aneurysmal bone cyst of the proximal phalanx of the thumb: successful replacement by tibial autograft. A case report. Clin Orthop Relat Res 1967;54:125-31.
7. Chari PR, Rao KM. Aneurysmal bone cyst of the fourth metacarpal bone. Aust N Z J Surg 1971;41:166-9.
8. Burkhalter WE, Schroeder FC, Eversmann WW Jr. Aneurysmal bone cysts occurring in the metacarpals: a report of three cases. J Hand Surg Am 1978;3:579-84.
9. Fuhs SE, Herndon JH. Aneurysmal bone cyst involving the hand: a review and report of two cases. J Hand Surg Am 1979;4:152-9.
10. Chalmers J. Aneurysmal bone cysts of the phalanges. A report of three cases. Hand 1981;13:296-300.
11. Barbieri CH. Aneurysmal bone cyst of the hand. An unusual situation. J Hand Surg Br 1984;9:88-92.
12. Lin E, Engel J, Bubis JJ, Herman O. Aneurysmal bone cyst of the hamate bone. J Hand Surg Br 1984:9:847-50.
13. Frassica FJ, Amadio PC, Wold LE, Beabot JW. Aneurysmal bone cyst: clinicopathologic features and treatment of ten cases involving the hand. J Hand Surg Am 1988;13:676-83.
14. Kotwal PP, Jayaswal A, Singh MK, Dave PK. Aneurysmal bone cyst of the metacarpal of a child: a case report. J Hand Surg Br 1988;13:479-80.
15. Kozlowski K, Azouz EM, Campbell J et
al. Primary bone tumours of the hand. Report of 21 cases. Pediatr Radiol 1988;18:140-8.
16. Milliez PY, Thomine JM. Rare benign bone tumors and dystrophy in the hand. Review of literature and report of four cases. Ann Chir Main 1988;7:189-201.
17. Dossing KV. Aneurysmal bone cyst of the hand. An unusual location in the first phalanx of the first finger. Case report. Scand J Plast Reconstr Surg Hand Surg 1990;24:173-5.
18. Mortensen NH, Kuur E. Aneurysmal bone cyst of the proximal phalanx. J Hand Surg Br 1990;15:482-3.
19. Rao GS, Keogh P, Webster H, et al. Aneurysmal bone cysts in the hand treated by free non-vascular transfer of metatarsal or proximal phalanx from the foot. J Hand Surg Br 1993;18:736-41.
20. Borrelli J Jr, McCormack RR Jr. Aneurysmal bone cyst involving the long finger metacarpal in a child: a case report. J Hand Surg Am 1994;19:800-2
21. Mankin KP, Bischoff RJ, Gelberman RH, Rosenberg AE. Aneurysmal bone cyst involving the lunate. J Hand Surg Br 1995;20:12-5.
22. Platt AJ, Klugman DJ. Aneurysmal bone cyst of the capitale. J Hand Surg Br. 1995;20:8-11.
23. Apaydın A, Ozkaynak C, Yilmaz S et al. Aneurysmal bone cyst of metacarpal. Skeletal Radiol 1996;25:76-8.
24. Sakka SA, Lock M. Aneurysmal bone cyst of the terminal phalanx of the thumb in a child. Arch Orthop Trauma Surg 1997;116:119-20
25. Athanasian EA, McCormack RR. Recurrent aneurysmal bone cyst of the proximal phalanx treated with cryosurgery: a case report. J Hand Surg Am 1999;24:405-12.
26. Sproule JA, Salmo E, Mortimer G, O'Sullivan M. Aneurysmal bone cyst of the proximal phalanx of the thumb in a child. Hand Surg 2002;7:147-50.
27. Gudemex E, Eksioglu F. Aneurysmal bone cyst of the thumb metacarpal: en-block resection and free toe phalanx transplantation. Orthopedics 2003;26:1229-30.
28. Havulinna J, Parkkinnen J, Laitinen M. Aneurysmal bone cyst of the index sesamoid. J Hand Surg Am 2005;30:1091-3.
29. Başarır K, Sağlık Y, Yildiz Y, Tezen E. Aneurysmal bone cyst of the hand: a report of four cases. Hand Surg 2006;11:35-41.
30. Sakamoto A, Tanaka K, Matsuda S, et al. Aneurysmal bone cyst of the capitulate: case report and a review emphasizing local recurrence. Fukuoka Igaku Zasshi 2006;97:302-7.
31. Tuzuner T, Subasi M, Alper M. The trapezium: a new location for an aneurysmal bone cyst. J Hand Surg Br 2006;31:347-8
32. Sahu A, Gujral SS, Gaur S. Extrasosseous aneurysmal cyst in hand: a case report. Cases J 2008;24;1:268.
33. Ozürek S, Rodop O, Kose O et al. Aneurysmal bone cyst of the fifth metacarpal. Orthopedics 2009;32.
34. Jafari D, Jamshidi K, Najdmazhar F et al. Expandile aneurysmal bone cyst in the tubular bones of the hand treated with en bloc excision and autograft reconstruction: a report of 12 cases. J Hand Surg Eur 2011;36:648-55.
35. Moussalem CD, Armalsteen DM, Khlifi H et al. Aneurysmal bone cyst of the lunate: case report. J Hand Surg Am 2011;36:106-9.
36. Kieseritzky J, Widenfalk B. Treatment of a large aneurysmal bone cyst in a 15-year-old boy using a corticospinal bone graft and a 12-year follow-up after operation. J Plast Surg Hand Surg 2012;46:132-6.
37. Rajappa S, Kumar MM. Aneurysmal bone cyst of lunate treated by excision without intercalar fusion: a case report. J Hand Surg Eur 2013;38:1007-8.
38. Singh P, Kumar R. Aneurysmal Bone Cyst In Metacarpal of a Child. J Orthop Case Rep 2013;3:3-6.
39. Al-Qattan MM. Bipolar electric catherization as adjuvant treatment after curettage of aneurysmal bone cysts of the hand. Ann Plast Surg 2014;72:38-40.
40. Pallapati SC, Thomas BP, Anderson GA. En bloc Excision and Matched Metatarsal Transfer for Expansive Benign Osteolytic Lesions of the Metacarpal. J Hand Surg Am 2016;41:e417-e423.
41. Zancolli EP, Ranson JM, Thirkannad SM. Aneurysmal Bone Cyst Involving the Pisiform: A Case Report. Hand Surg 2017;12:NP55-7.
42. Nanda SN, Tripathi S, Shiraz SM, Warrier S. Aneurysmal Bone Cyst of 3rd Metacarpal, Management and Follow-up: A Case Report. J Orthop Case Rep 2018;8:9-12.
43. Zaidenberg EE, Farias Cisneros E, Miller R, Zaidenberg CR. Metacarpal Aneurysmal Bone Cyst En Bloc Resection Reconstructed With Osteoarticular Allograft. J Hand Surg Am 2019;44:425.e1-5
44. Dhamangaonkar AC, Sathe A, Banerjee S. An Unusual Case of Aneurysmal Bone Cyst of Proximal Phalanx in a 2 Year Old Child. J Hand Surg Asian Pac 2020;25:114-8.
45. Martinez v, Sissons HA. Aneurysmal bone cyst: a review of 123 cases including primary lesions and those secondary to other bone pathology. Cancer 1988;61:2291-304
46. Dabska M, Buraczowski J. Aneurysmal bone cyst: pathology, clinical course and radiologic appearance. Cancer 1969;23:371-88.
47. Perisano C, Rosa MA, Donati F, et al. Treatment options of simple bone cysts: the role of bone substitutes, growth factors and literature review. J Biol Regul Homeost Agents 2016;30:159-64.
48. Cericllo S, Careri S, D’Adamo S, et al. Aneurysmal bone cysts. Minerva Ortop Traumatol 2017;68:220-6.
49. Careri S, Vitiello R, Oliva MS, et al. Masquelet technique and osteomyelitis: innovations and literature review. Eur Rev Med Pharmacol Sci 2019;23:210-6.
50. De Vitis R, Passiato M, Cilli V et al. Intramedullary nailing for treatment of forearm non-union: Is it useful? - A case series. J Orthop 2020;10:20:97-104.
51. De Vitis R, Passiato M, Perna A et al. Modified Matti-Russe technique using a "butterfly bone graft" for treatment of scaphoid non-union. J Orthop 2019;27; 19:63-6