THE SURGICAL TREATMENT OF CHRONIC RECURRENT HEMATOGENOUS OSTEOMYELITIS IN CHILDREN

The results of surgical treatment of 178 patients with chronic recurrent hematogenous osteomyelitis of the tube bones have been analyzed. It has been proposed the tactic of surgical treatment consisting of the tear of tissues for a distance of the diaphysis of the affected bone, cautious periosteum exfoliation from the bone, longitudinal osteotomy, sequestrectomy with full restoration structure of intramedullary canal along the whole length, lavage and ultrasound cavitation with antiseptic solution. The performed surgical tactic secured the most radical sanation of the osteomyelitic foci and improved the treatment results of this severe pathology.

SUKHROB ZAYNIEV
Department of Hospital Children's Surgery, Samarkand State Medical Institute, Uzbekistan

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Introduction

One of the challenging issues of purulent surgery is left hematogenous osteomyelitis. The disease, which began in childhood, is difficult to treat and rehabilitate. In the process of child growing it often leads to different anatomical and functional disorders of musculoskeletal system and disablement in childhood and in the young working age, thus reducing the quality of life. Though there is significant success in the treatment of acute hematogenous osteomyelitis (AHO), we can observe preserving high development frequency of chronic osteomyelitis which according to different authors makes from 10 to 60% (Akzhigitov and Yudin, 1998; Robiller, Stumpe, Kossmann, Weisshaupt, and von Schulthess, 2000). Frequency of failures in the treatment of chronic hematogenous osteomyelitis (CHO) is not decreasing, and recurrences after surgical treatment make 10-42% (Rubin and Farber, 2004; Sullivan, Rosenfield, Ogden, and Gottschalk, 2004). The main causes of recurrences of chronic osteomyelitis are defective sanation of injury focus (Ali-Zade, 2003; Barskaya, Kuzmin, Kuskov et al., 2000; Svetuhin, Amirslanov and Borisov, 2001), which make necessary the implementing radical methods of surgical treatment.

The aim of investigation was to improve the results of surgical treatment and prevention of recurrences of chronic recurrent hematogenous osteomyelitis by the way of elaboration of new methods of surgical treatment.

Materials and methods

The present work presents the results of surgical treatment of 178 patients with chronic recurrent hematogenous osteomyelitis (CRHO) of the long tube bones. 50% were patients with the age from 12 to 16 years old, 30% - ones with the age from 16 to 22 years old. Boys made the most off the total - 112 (62.9%) patients.

Depending on the methods of surgical treatment all patients were divided into two clinical groups. Control group included 100 children with CHO of long tube bones receiving traditional surgical treatment. Study group comprised 78 patients who had surgical treatment by the elaborated method; earlier all patients of this group were repeatedly operated due to CHO and its recurrences.
During the analyses of the disease duration it was determined that the chronic hematogenous osteomyelitis more often lasted 4-7 years (50%) in basic group of patients, and 1-3 years (86%) - in the control group of patients. Predominance of the long period of disease in the basic group was associated with the chronic recurrent hematogenous osteomyelitis; in this occasion it had been carried out sequestrectomy of the injured bone. Examination determined that sequestrectomy was carried once in 144 (80.7%) patients with the chronic osteomyelitis, 34 (19.3%) patients were surgically operated twice. In the both groups osteomyelitic process most often took place in shin bone in 73 (43.7%) patients and in femoral bone in 66 (39.5%) patients.

Before the complex of investigation and surgical treatment we agreed on the consent with the parents of all children for the planning diagnostic and treating manipulations.

Computer tomography (CT) was included in the complex of preoperative diagnostics alongside with general clinic, laboratory and plan radiography in all patients. CT, in contrast of plan radiography, allowed determining more exactly the real sizes of destructive process in the injured bone (Figures 1 a, b).

**Figure 1. General X-ray examination (A) and computer tomography (B) of the right shin bone. It has been determined the presence of intraosseous abscess which clearly visualized on CT**

![CT scan of shin bone](image)

With the purpose of the study structural features of the bone tissue in patients with CRHO it has been carried out morphological investigation of the osteomyelitic foci received during surgical operation. Morphological investigations showed that in CRHO it has been significantly changed the structure of bone narrow (pyknosis of bone narrow cells and perinuclear edema with enlargement of fibers of connected tissues). Necrosis of osteocytes, destruction of the bone plates up to disintegration of fiber components of bone tissue were noted in bone tissue. Necrotic fragments of the bone tissue were undergone sequestration (Figures 2, 3). Micro-abscesses were found between the fibers of the connected tissue.

All patients proceeded surgical treatment by the proposed method (patent “Method of surgical treatment of chronic recurrent hematogenous osteomyelitis” IAP 03377, Uzbekistan). Operative treatment was undertaken after reduction of acute inflammatory process. Operative intervention was carried out under general anesthesia.
The choice of access to the pathological focus is the important moment of any operation. In the case of injuries of shin bone the most optimal is anterior-lateral access, while the lateral access is preferred in the injuries of the femoral bone. The skin incision with syringectomy or without it could be some longer than the assumed destructive focus in the bone. Thickened periosteum was longitudially dissected through dissection of layers of subcutaneous tissue, fascia and by moving muscles to both sides. Periosteum was carefully separated from the bone in both sides along the whole length of the injured part of the bone. Delicate caring to periosteum was the factor for good reparative bone
regeneration in the postoperative period. Visually cortical layer of the bone had uzuration, and often there was bone thickening in this area. Longitudinal osteotomy of the bone was carried out (Figure 4) in 6-10 mm wide and in length of the appropriate extend of pathological changes of the bone tissue. Depending on the revision results and condition of the pathological process the defect could be longitudinally enlarged to the optimal length. Opening of intramedullary canal was being followed by sanation stage of the pathological focus. Sanation began with lancing of intraosteoal abscesses with mechanical cleansing of the internal walls of the bone cavities from the areas of osteonecrosis and purulent detritus (Figure 5). The same manipulation was performed with the bone areas lacking viability. Sequestrectomy was carried out on the whole sphere of the bone cavity until visually viable bone. Few cavities, scattered on the whole bone diaphysis with osteosclerotic septum, were excised by forming the single cavity; it resulted with restoration of the anatomic structure of intramedullary canal on the whole length. The formed cavity was being modeled by compacting and rounding edges in order to form wash-tub.

Wound and bone cavity was carefully and repeatedly irrigated by antiseptic solution with ultrasound cavitations (USC) by the use of URSK-7H with power of 40-70 kGz with scoring exposure of 10 minutes. The abundant irrigation could allow us to remove small sequesters, purulent detritus and other nonviable tissues. The earlier exfoliated periosteum was sutured by the loose closure under the blood clot with antibiotic which filled the residual cavity. Then the soft tissues were fully sutured in layers. it has been Bacteriologic control of intramedullary canal performed intraoperationally after mechanical sanation with USC.

In all investigated patients St. aureus was determined in 54 patients (67%), E. Coli was determined in 12 patients (15%), Proteus vulgaris was determined in 3 patients (4%) and associative microflora of staphylococcus with E. Coli was determined in 8 patients (10%). 3 (4%) patients did not show any bacteria.

In the postoperative period the operated limb was immobilized by plaster splint, it was carried out antibacterial, immunocorrective therapy and physiotherapy sessions.

![Figure 4. Longitudinal osteotomy of the right shin bone](image-url)
Results and discussion

During the analyses of the direct results of the treatment it was determined that normalization of the body temperature in patients of the control group was occurring on average in 2.4 ± 0.1 days, in the basic group this index was taking place during 2.1 ± 0.1 days. Healing of the wound by primary adhesion during traditional treatment has been obtained in 65 (65%) patients, whereas in the basic group it has been obtained in 73 (93%) patients. Sutures from the wounds in the control group were taken off on average in 12.3 ± 0.2 days, while in the basic group this index made 10.6 ± 0.2 days. Duration of the patient’s hospitalization were linked to the effectiveness of disease treatment in the clinical groups and significantly decreased in the basic group in 21.1 ± 0.4 days against 29.2 ± 1.9 (p < 0.001) days in the control group.

Consequently, the early postoperative period was significantly favorable in patients of the basic group. It shows on the effectiveness of the proposed method of surgical treatment.

Immediate results of treatment

In order to evaluate the effectiveness of the elaborated surgical tactic there were studied the immediate results of treatment of 162 (91%) during a year after operation. The assessment of the immediate results was evaluated due to three-point system - results were classified as good, satisfactory and unsatisfactory. The assessment criterion of the
treatment results was the presence of exacerbations, opening of the sinus tract and recurrences of the disease. During the assessment of the immediate results a good result was considered as uncomplicated duration of postoperative period, wound healing by primary intention, absence of exacerbations and recurrences. We considered satisfactory results when after departure from the hospital there were determined exacerbations like infiltration and wound abscess, appearing of the fistulas which had short term and superficial character and it was not spreading on the bone. Fistulas in these patients were obliterated during 1-6 months after conservative treatment. As unsatisfactory results were considered when after departure from the hospital patients experienced development of the new purulent fistulas and the X-ray examination found the changes characterized for the recurrence of the osteomyelitic process.

In the control group of patients exacerbation of the pathological process was observed in 17 (19%) patients, recurrence of the disease was observed in 14 (13%) patients, whereas in the second group exacerbations occurred in 2 (2.7%) patients and recurrences of the pathological process were absent. The development frequency of the purulent fistulas in the immediate periods of treatment in the control group was examined in 31 (34%) patients, while in the basic group formation of the fistulas was not observed. The most of good results were received in patients of the basic group (97.2%) in the comparison with the control group (66.6%). Satisfactory results in the control group were significantly high (18.8%) than in the basic group (2.7%). Unsatisfactory results in the basic group were not observed whereas in the control group they were observed in 14.4% of cases.

We studied distant results of treatment in the period from 1 to 8 year in 151 (85%) patients including 91 (91%) patients in the control and in 60 (77%) patients in the basic group. In the period of 1-2 years there were observed 66 (43.7%) patients; 3-5 years - 51 (33.8%) patients; and 6-8 years - 34 (22.5%) patients. Assessment of the distant results was carried out according to the criterion proposed by Akzhigitov (Akzhigitov and Yudin, 1998) with some changes; variations of assessment included good, satisfactory and unsatisfactory results.

Cases revealed the absence of the pain, fistulas, exacerbations and recurrences of the disease, functional disorders of the operated limb, as well cases demonstrated full restoration of the bone structure and normal radiological picture were considered as good results.

The presence of periodical pain which had seasonal character, small functional disorders of the adjacent joints, inexpessive axial deformation and shortening of limb until 3 cm in the absence of exacerbations sequesters and destructive focuses in the bone were considered as satisfactory results.

Cases which had many exacerbations, recurrences of the disease, presence of the fistulas, destructive cavities and obliteration of medullary canal requiring repeated surgical treatment, and also orthopedic complications like shortening of limb more than 3 cm, ankylosis of joints and significant axial deformation of limb were considered as unsatisfactory results.

One of the main manifestations of recurrences of CRHO was the case of the opening of the sinus tract which had been developed only in 3 (3.3%) patients of the control group. During the investigation in the period of 1-2 years after operation, the recurrence of the purulent process with subsequent sequestrectomy was found in 4 (4.4%) patients of the control group, while the recurrence was not noted in the basic group during this period of examination. In the period of 3-5 years after operation, repeated sequestrectomy was carried out in 4 (4.4%) patients of the control group and in 1 (1.2%) patient of the basic group. During the study of the distant results in the period of 6-8 years after operation, the recurrence of the pathological process requiring repeated sequestrectomy was observed in 5 (6.6%) patients of the control group. Analysis of the distant examination periods found that the general amount of recurrences and repeated sequestrectomies took place in 13 (14.3%) patients of control group, whereas in the
basic group we noticed the obvious tendency to decrease of the recurrences and repeated sequestrectomies until 1.2%. Good results were fixed in 88.3% of patients of the basic group and only in 75.9% of patients in the control group. Satisfactory results in the basic group were in 8.3% of cases, while in the control group they were noted in 8.8% of cases. The amount of unsatisfactory results in the basic group was significantly less (1.2%) than in the control (15.3%) group.

Thus, the presented results testified that the use of the proposed diagnostic complex and tactic of the surgical treatment allowed us receiving good results with a high authenticity. On the grounds of these results we consider useful the use of the proposed method of surgical treatment in patients with CHO.

References

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