



Miniinvasive biodegradable PLGA osteosynthesis in the treatment of children's distal tibial fractures

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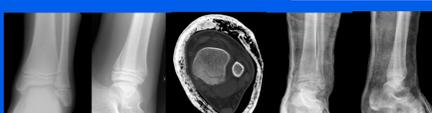
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Introduction: According to literature data the fractures of metaepiphysal area of tibia make up to 7 % of all children with orthopedic trauma. [A.S. Afanasyev, L.B. Pujickiyi, 1996, D. Yu. Basargin, 2010, J.R. Cass, H.A. Peterson, 1983, C.O. Carothers, A.H. Crenshaw, 1953, J.P. Yang, R.M. Letts, 1997]. Based on the classification of R.B. Salter and W.R. Harris (1963) there are 5 types of damages of physis (growth zones). [D. Yu. Basargin, 2010, J.R. Cass, H.A. Peterson, 1983].

Classification of damages:



Treatment of distal tibia fracture



Damage Salter R.B., Harris W.R. Types I-II, diastasis between the bone fragments up to 2mm.

Damage Salter R.B., Harris W.R. Types I-II, with atypical offset

Damage Salter R.B., Harris W.R. Types I-II, diastasis between the bone fragments more than 2mm.

Objective: Evaluate advantages and define indications for carrying out of osteosynthesis with biodegradable implants in children's distal tibial fractures.

Materials and methods:

Pediatric juxta- and intraarticular fractures are considered to be indications for using biodegradable implants. 81 children with juxta- and intraarticular fractures were admitted and operated since November 2011 until today in our institut.

All patients had an X-ray examination on admission as well as CT scan to clarify the kind and severity of damage of articular surface. X-ray control was made intraoperatively. Therapeutic exercises started on the first day after surgical treatment. X-ray and ultrasound investigations were done on the 10th day and after that the child was dismissed from hospital for outpatient follow-up observation.

Results:

36 operations were done on children with fractures in the epiphysis area. All intraoperative X-ray revealed satisfactory standing of the fragments, external immobilization was not needed. Ultrasound confirmed local reactions for implants and radiographic examination showed the satisfactory standing of fracture fragments, revealed stable osteosynthesis. No complaints, no generalized or local reaction were mentioned during the early postoperative stage. The average hospital stay was 10 days; children were discharged from the hospital in satisfactory condition, non weight-bearing ambulation on crutches, with full range of motion in related joints.

Full weight-bearing was allowed after the X-ray investigation on 3rd to 40th day after the surgical treatment. Fracture union took place within the established age time limits. On the follow-up visits after 3 weeks, 6 months and 1-2 years there were no complaints; children were not limping; they had full range of motions in the joints; no local reaction on the clinical examination and ultrasound investigation was mentioned.

Such complications as dislocation of bone fragments, implant migration, fracture union delay, inflammation and stiffness in the damaged joint as well as local reaction to the implant were not mentioned in a period of follow up study for a year and a half.

Conclusion: Analyzing the treatment results it was found out that there were no difficulties installing these implants. One more advantage of using biodegradable implants is that there is no need for fixation removal after the bone union is formed, which is very important in childhood. Such complications as local or generalized reaction for the implant, in the early postoperative period and during the follow-up study (for one and a half and next years were not noticeable during the ultrasound control. Juxta- and intra-articular fractures of tibial metaepiphysal area are considered to be indication for using biodegradable implants, given the very positive treatment results.

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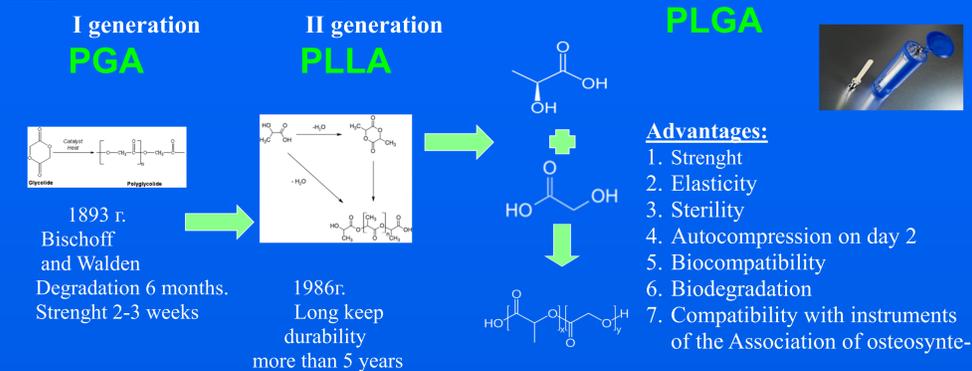
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Searching for the right material with strength reserve to be as good as metal and with no need for removal is still a subject for research of new biopolymer formula that will be inert (inactive) during biodegradation.

Types of biodegradable implants:



Fixing devices made of synthetic biodegradable poly-lactic-co-glycolic acid (PLGA) polymer in the ratio of 85:15 and different combinations of lactides and glycolic acid such as lactide 80: glycolic acid 20; 82:18; 70:30 are commonly used abroad. Researchers distinguish these polymers according to their strength (resistance), satisfactory elasticity coefficient and optimal dehydration period. [E. Waris et al., 2004]. However there are no definite answers about the possibility of using PLGA implants in children's traumatology.



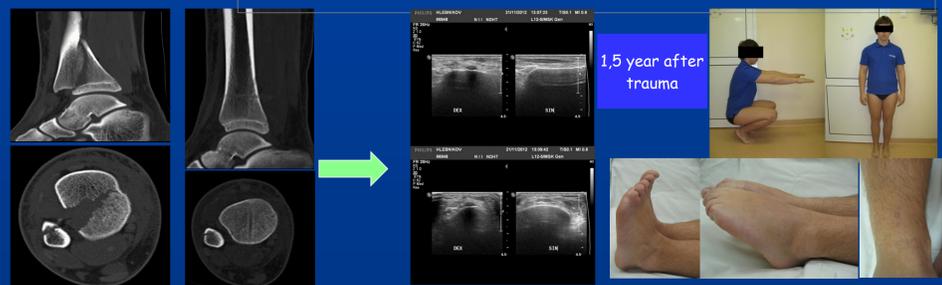
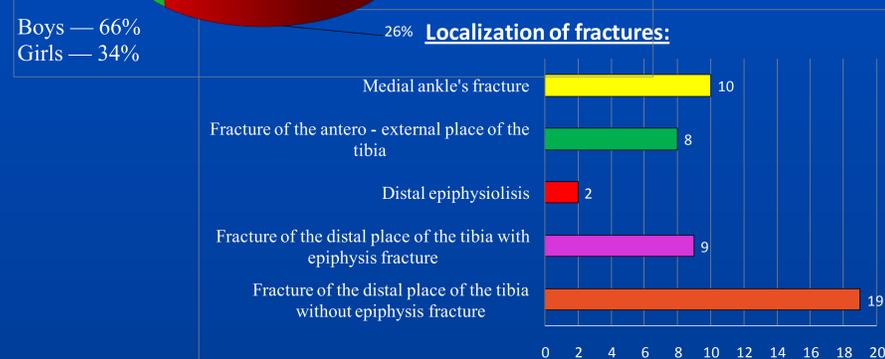
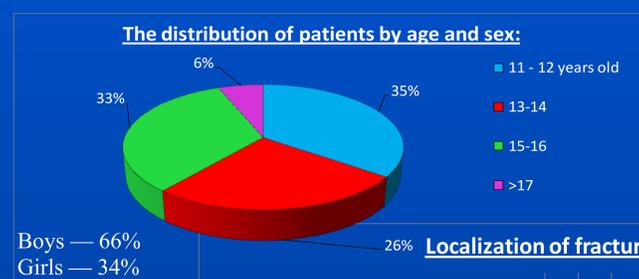
Cannulated screws



Uncannulated screws



Screw with antibacterial drug (Ciprofloxacin)



1,5 year after trauma