

TREATMENT OF INFECTED TIBIAL NONUNIONS WITH ILIZAROV TECHNIQUE AND BIOACTIVE GLASS

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BACKGROUND

Ilizarov external fixation technique has been widely used for the treatment of long-bone infected nonunion. After surgical bone resection, the possible filling of remaining bone gap is possible using biomaterials with antibacterial properties..

Objectives:

Aim of this study is to report the multicentric experience of authors on treatment of infected nonunions of tibia with Ilizarov technique and antibacterial bioactive glass.

**From April 2005 to December 2014
26 CASES OF INFECTED TIBIAL NONUNION**

- ### TREATMENT PROCEDURES
- 1) Removal of devices of previous fixation
 - 2) Tibial medullary canal reaming and debridment
 - 3) Tibial metaphyses osteotomy
 - 4) Circular fixator (Ilizarov technique) and starting of bone transport
 - 5) Filling of residual bone gaps with by bioactive glass S53P4
 - 6) Soft tissue coverage, if required

STUDY DESIGN & METHODS

Between April 2009 and December 2014, 26 patients with infected tibial nonunion were treated with Ilizarov technique and possible use of bioactive glass S53P4. All patients were clinically and radiographically evaluated using using the Association for the Study and Application of Methods of Ilizarov (ASAMI) criteria and the American Orthopaedic Foot and Ankle Score (AOFAS).

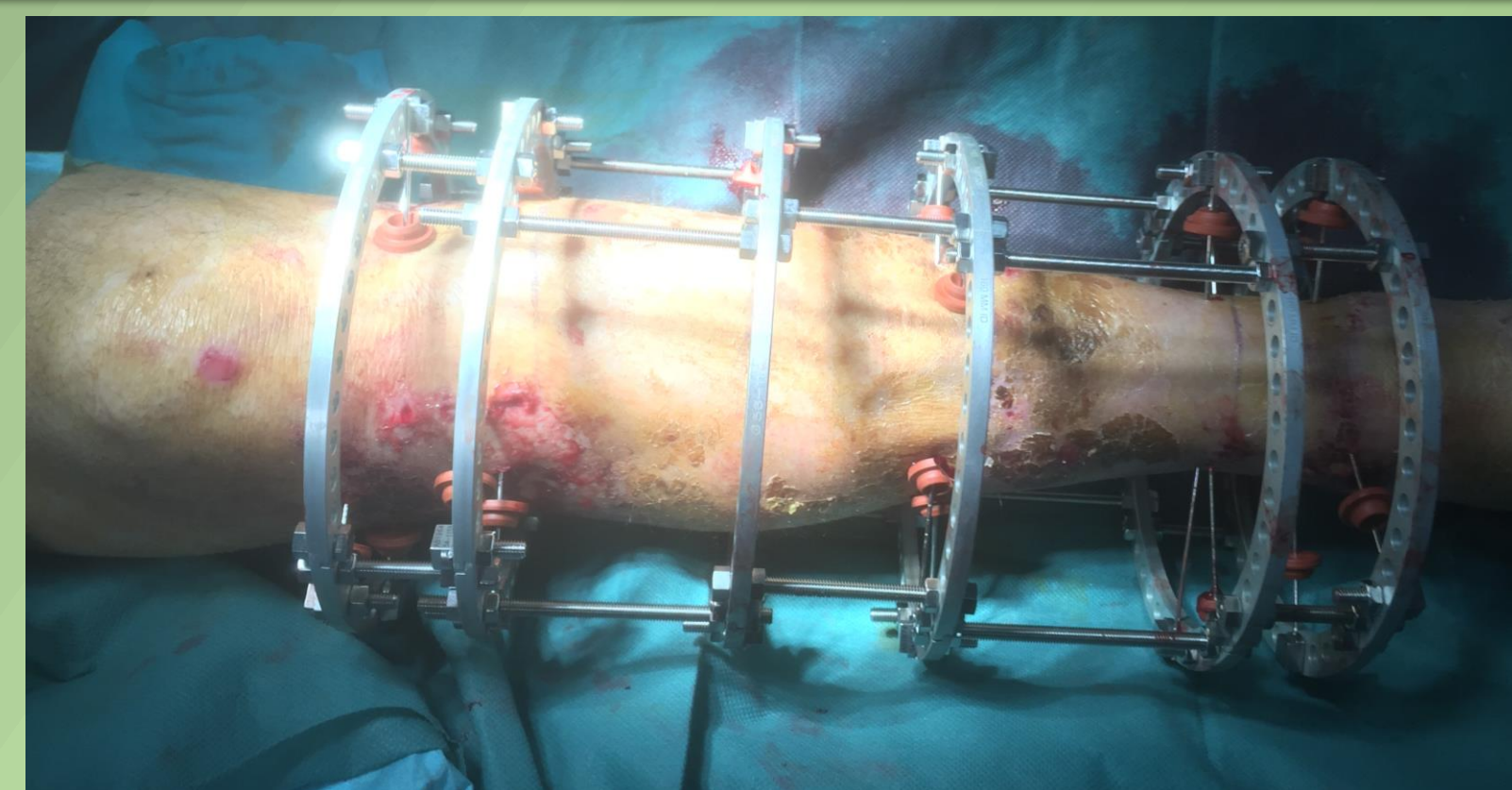


Fig. 1. Ilizarov technique



Fig. 2. Filling gap by BGS53P4

RESULTS

Average age at the start of treatment was 51.1 years. The mean follow-up was 113 weeks. Clinical and radiographic results according to the ASAMI Bone Scoring System were excellent in 10 (38.5%) cases, good in 12 (46.1%) and according to ASAMI functional Scoring System they were excellent in 16 (61.5%) cases, good in 9 (34.6%). The average AOFAS score was 85.5 ± 6.2.

	FUNCTIONAL RESULTS	N
Excellent	Active, no limp, minimum stiffness (loss of < 15° knee extension / < 15° dorsiflexion of ankle), no reflex sympathetic dystrophy, insignificant pain	16 (61,5%)
Good	Active with one or two of the following: Limp, stiffness, reflex sympathetic dystrophy, significant pain	9 (34,6%)
Fair	Active with three or all of the following: Limp, stiffness, reflex sympathetic dystrophy, significant pain	1 (3,9%)
Poor	Inactive (unemployment or inability to return to daily activities because of injury)	0
Failures	Amputation	0

Table 1. ASAMI Score: Functional results

	BONE RESULTS	N
Excellent	Union, no infection, deformity < 7 degree, limb-length discrepancy < 2.5 cm	10 (38,5%)
Good	Union + any two of the following: absence of infection, deformity < 7 degree, limb-length discrepancy of < 2.5 cm	12 (46,1%)
Fair	Union + only one of the following: absence of infection, deformity < 7 degree, limb-length discrepancy of < 2.5 cm	4 (15,4%)
Poor	Nonunion/re-fracture/union + infection + deformity > 7 degree + limb-length discrepancy > 2.5 cm	0

Table 2. ASAMI score: Bone results.

Authors	Patients	Frame	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Failures
Present study	26	Ilizarov	61,5	34,6	3,9	0	0
Rohilla et al. ²²	35	Ilizarov	45,7	48,5	2,9	0	2,9
Maini et al. ²³	30	Ilizarov	27	40	10	23	0
Chaddha et al. ²⁴	25	Ilizarov	24	36	16	36	0
Yin et al. ²⁵	66	Ilizarov	40	43	17	0	0
Patil et al. ⁷	78	Ilizarov	41	41	6	6	6
Farmanullah et al. ²⁶	58	Ilizarov	57	31	7	5	0

Tables 3-4. Comparison of ASAMI score of several studies

Authors	Patients	Frame	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Present study	26	Ilizarov	38,5	46,1	3,9	0
Rohilla et al. ²²	35	Ilizarov	60	34,3	0	5,7
Maini et al. ²³	30	Ilizarov	70	10	0	20
Chaddha et al. ²⁴	25	Ilizarov	52	4	0	44
Yin et al. ²⁵	66	Ilizarov	67	23	7	3
Patil et al. ⁷	78	Ilizarov	41	34	10	15
Farmanullah et al. ²⁶	58	Ilizarov	57	21	14	8

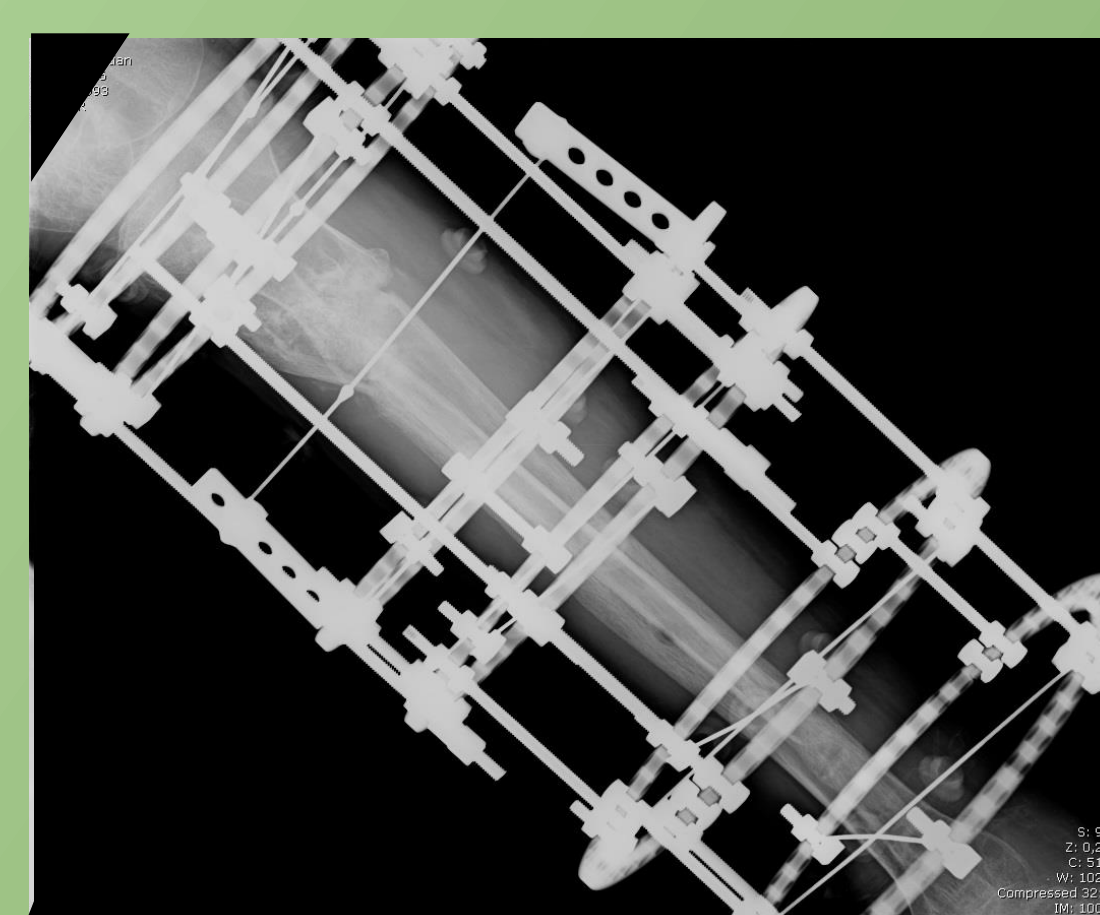


Fig. 3. Bone gap filled with BGPS53P4

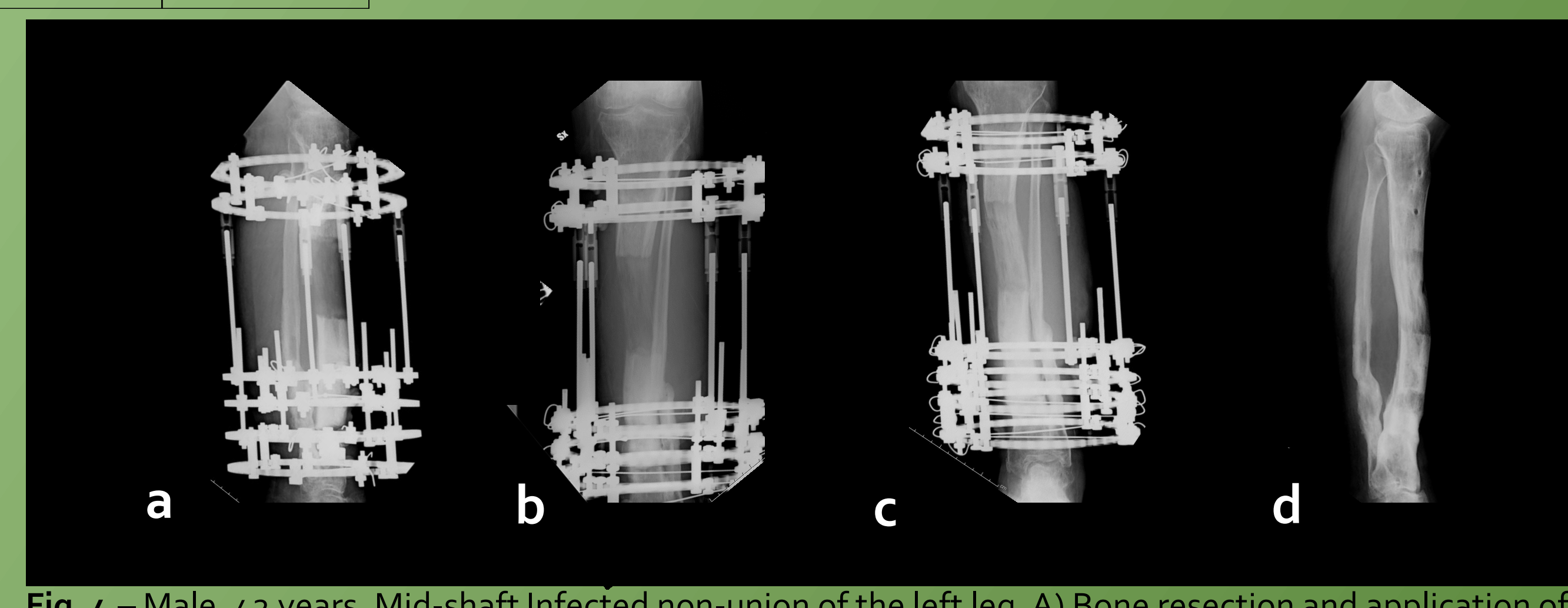


Fig. 4 - Male, 42 years. Mid-shaft Infected non-union of the left leg. A) Bone resection and application of circular fixator; B) Regenerated bone after one month; C) After five months; D) After two years.

CONCLUSIONS

Treatment of infected tibial nonunion by the Ilizarov technique was effective in bone segment regeneration. To fill remaining bone gap, bioactive glass S53P4 could be used, allowing the decrease of re-interventions, enabling a potential financial advantage in terms of cost reduction.