

• • • • • • • •

<	>
:	:
:	:
: 2001 7	2002 5
5	7 8
5	5
: 15	2, 1, 1, 1
	3 71%
37.5%	
:	
	가
:	
:	

: 158-710 911-1,

TEL : 02-650-5276
FAX : 02-2642-0349
E-mail : yhyun@mm.ewha.ac.kr

* 2002

150 가 1 1
20 .
fig. 1,2.
Exogen 2000+TM 1 1
20 1

5
3).
,
70-90%
가 가
3).
Piezoelectric
가
9,4).



Fig. 1. To apply exogen 2000+TM , marking was done at fracture site under fluroscopic guiding



Fig. 2. Exogen 2000+TM was applied at marking site.

2001 7 2002 5
18 20
22 65 43.5
가 16 가 4
6
9

12.7
Smith & Nephew
2000+TM
1.5MHz
가
6 46
20 Exogen
30mW/cm2
20

20 2 ,
3 , 2 , 2 , 1 ,
6 , 2 , 1
1 가 . 1
1

(fig. 11,12.)

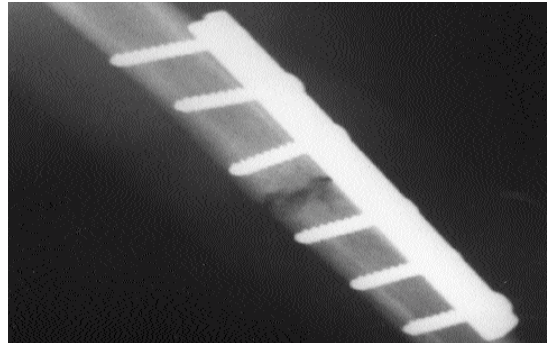


Fig. 3. 43-years old female with fracture on humerus left, 5 months after operation in AP view union was not shown.

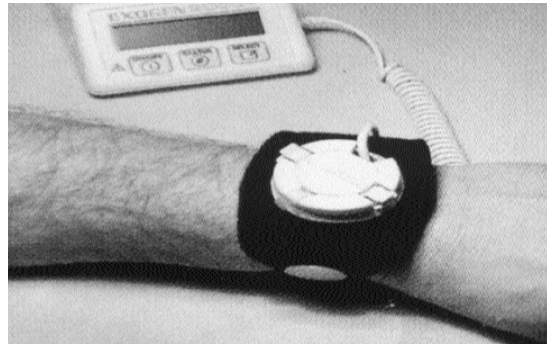


Fig. 4. 43-years old female with fracture on humerus left, 5 months after operation in lateral view union was not shown.

1
1
2 .5
15
7 2 ,
1 1 8
5 3
7 5 (71%), 8
3 (37.5%)
20
17 (85%)

2
가 370
가 410
Exogen2000+TM 200

1.
43 5

5
(fig. 3,4.)
(fig. 5,6.)

Exogen2000+TM 5
(fig. 7,8.)

2.
51 19
10

9,10.)
5

2 가 1). Ryaby
13,15,16)
calcium 가
2
adenylate cyclase
가 ,
가 growth factor-
2). 가 2
(fig.

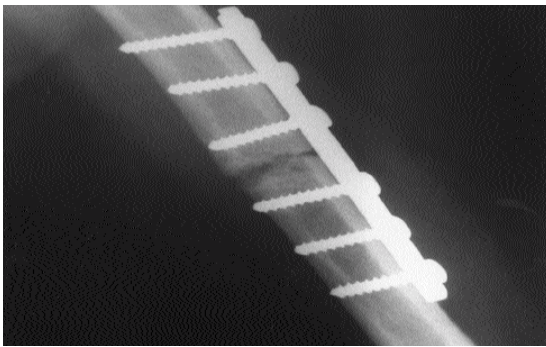


Fig. 5. 43-years old female with fracture on humerus left, 8 months after operation in AP view union was not shown.

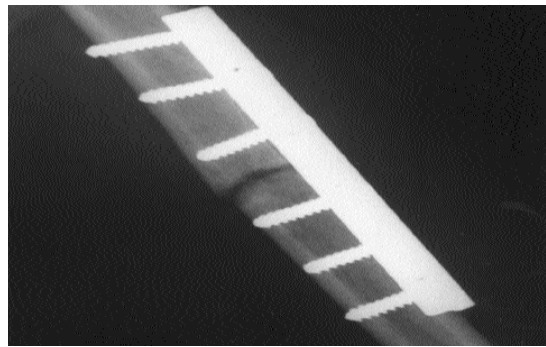


Fig. 6. 43-years old female with fracture on humerus left, 8 months ago after operation in lateral view union was not shown.

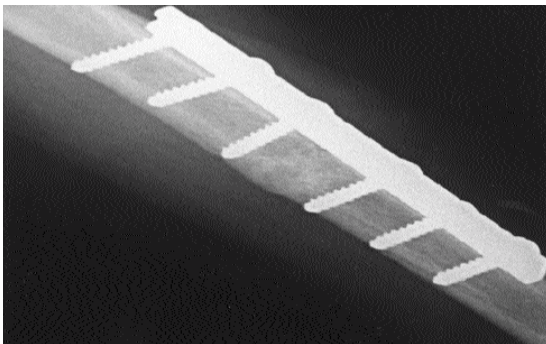


Fig. 7. 43-years old female with fracture on humerus left, After Exogen 2000+TM treatment for 5months, union was shown in AP X-ray.

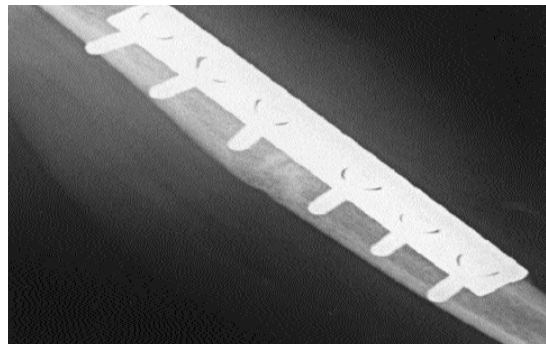


Fig. 8. 43-years old female with fracture on humerus left, After Exogen 2000+TM treatment for 5months, union was shown in lateral X-ray.



Fig. 9. 51-years old male with fracture femur shaft 10 months after operation in AP view union was not shown.



Fig. 10. 51-years old male with fracture femur shaft 10 months after operation in lateral view union was not shown.

8) 가 가 ^{15,16)} Kokubu
(30mW/cm2)
cyclooxygenase-2 mRNA
Prostaglandin-E2 가 가

가 . Ito ⁷⁾

Table 1. Summary of cases.

case No	Age/Sex	Diagnosis	Fracture Treatment	Fracture Age (months)	Nonunion Treatment History	Union
1	51/M*	Fracture femur	IM ‡ nail	19	Bone graft	X
2	43/M	Open fracture femur	External fixator	16	Exchange IM nail	O
3	43/F †	Fracture humerus	Plate & screws	8	-	O
4	40/M	Fracture femur	IM nail	15	Dynamization	O
5	52/F	Fracture tibia	External fixator	8	-	O
6	50/M	Fracture femur	Plate & screws & bone graft	14	IM nail & bone graft	O
7	63/M	Comminuted fracture tibia	IM nail	6	-	O
8	45/F	Fracture humerus	Plate & screws	46	Bone graft	X
9	57/M	Fracture femur	Plate & screws	6	-	O
10	52/M	Open fracture both forearm bone	External fixator & plate	6	-	X
11	43/M	Fracture radius	K-wire	6	-	O
12	53/M	Fracture femur	IM nail	20	-	X
13	53/M	Fracture fibular	-	20	-	X
14	54/M	Fracture tibia	Cast	6	-	X

*Male, † Female, ‡ intramedullary

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Abstract

The Usefulness of Low-Intensity Ultrasound for Nonunion and Delayed Union

Yeo-Heon Yun M.D., Jong-Oh Kim M.D., Young-Do Ko M.D., Jae-Doo Yoo M.D.,
Jun-Mo Jung M.D., Jong-gun Oh M.D., Han-Chen Bang M.D., Chang-Ho Choi
M.D., Myeung-cheol Shin M.D.

*Department of Orthopedic Surgery, College of Medicine,
Ewha womans University, Mok-Dong Hospital Seoul, Korea*

Purpose : To evaluation of usefulness of low-intensity ultrasound for nonunion and delayed union.

Materials and Methods : For 5 months, we treated 7 delayed union and 8 nonunion using low-intensity ultrasound. After 5 months, in checked X-ray AP and Lateral view, when cortical bridge formation was done, we through union.

Results : In 7 delayed union, 5 cases-2 femur, tibia, humerus, radius were healed. In 8 nonunion, 3 femur nonunion were healed. Union rate was 71% in delayed union 37.5% in nonunion.

Conclusion : we thought that the low-intensity ultrasound has capacity of induction of union and was considered as the method of treatment for delayed union.

Key Words : nonunion, delayed union, low intensity ultrasound.

Address reprint requests to

Yeo-Heon Yun

Department of orthopeadic surgery, school of medicine,
Ewha woman 's University, 911-1, Mok-dong,
Yangcheon-Gu, Seoul, 158-710, Republic of Korea

TEL : 02-650-5276

FAX : 02-2642-0349

E-mail : yhyun@mm.ewha.ac.kr