

가

가

1

2. 가

4 - 0 chromic cat - gut(Ethicon Ltd England)

(2)

30

2 가 가

12 , 가

6Aluminum - 4Vanadium, Titanium -
 13Zirconium - 6Niobium, Titanium -
 6Zirconium - 6Sn - 6Niobium Titanium -

가

0.5mm, 10mm 가 10%

3

가 3mm

3. (Osteo - bed bone embedding solution, Polyscience, Inc. Warrington, PA, U.S.A.)

2% (Rompon, (Exakt Apparatebau, Norderstedt, Germany)

) 0.2ml/kg

(1:100,000) 2% 15 μ m

(, ,) toluidine blue (Olympus BH - 2, Olympus Co. Tokyo, Japan)

(1) 가 (3)

Brånemark Global Lab Image Analysis System(Data Translation Inc, Malboro, MA, U.S.A)

2-3 가 (Olympus BH - 2, Olympus Co. Tokyo, Japan) CCD (ITC - 47, Ikegami Tsushinki Co. Ltd, Tokyo, Japan)

1cm (framefrabber)(1DT - 55, Data translation Inc., U.S.A.)

10 3 256 (gray level) 가 640 x 480 (pixel)

4

(Global Lab Image Analysis System, Data Translation Inc, Malboro, MA., U.S.A.)

25.27Ncm ± 13.14 (range; 22.5 - 50),
 Titanium - 13Zirconium - 6Niobium
 31.59Ncm ± 15.66 (range: 15 - 57.5),
 Titanium - 6Zirconium - 6Sn - 6Niobium
 37.44Ncm ± 11.67 (range: 22.5 - 57.5)
 (1). (Ti -
 6Al - 4V) 2

(p<0.05, Wilcoxon Signed Rank Test).

(4)
 Wilcoxon matched - pairs signed rank sum test

P<0.05, 12
 P<0.01

Titanium - 6Aluminum -
 4Vanadium 46.47% ± 8.90 (range:
 29.42 - 64.73), Titanium - 13Zirconium -
 6Niobium 53.09% ± 13.56 (range: 37.99 -
 79.31), Titanium - 6Zirconium - 6Sn -
 6Niobium 47.21% ± 12.97 (range:
 31.02 - 73.72) (2).
 Ti - 13Zr - 6Nb
 Titanium - 6Aluminum - 4Vanadium (Ti - 6Al - 4V) Ti - 6Zr - 6Sn -

1. Comparison of removable torque force of titanium alloys

Titanium alloys	Mean ± S.D(Ncm)
Titanium - 6Aluminum - 4Vanadium	25.27 ± 13.14*
Titanium - 13Zirconium - 6Niobium	31.59 ± 15.66
Titanium - 6Zirconium - 6Sn - 6Niobium	37.44 ± 11.67

* P<0.05

2. Comparison of bone contact ratio

Titanium alloys	Mean ± S.D.%
Titanium - 6Aluminum - 4Vanadium	46.47% ± 8.90
Titanium - 13Zirconium - 6Niobium	53.09% ± 13.56
Titanium - 6Zirconium - 6Sn - 6Niobium	47.21% ± 12.97

No statistical difference was found between any two groups.

6Nb (p>0.01, Wilcoxon Signed Rank Test).

IV.	Zirconium niobium
4) Brånemark	3, 15, 16). Zirconium
vanadium 가 Titanium - 6Aluminum - 4Vanadium(Ti - 6Al - 4V) 6).	가 3, 17) plastic 6
가 6, 7, 8) 가	plug 가
hextop , scratch,	16, 18). Kobayashi 19) zirconium 50%
Ti - 6Al - 4V	zirconium 가 2.5
9, 10). Ti - 6Al - 4V	가 . Niobium
vanadium aluminum 가	Johansson 15, 20) 가
Woodman 13) 가 11, 12).	Seligson 21) diffusion hardened Ti - 13Nb - 13Zr
aluminum 가 ,	. Ito 22) L929 MC
vanadium . Maurer 14)	3T3 - E1 Ti - 6Al - 4V ELI
vanadium 10µg/ml ,	Ti - 10Zr - 8Nb - 2Ta - 0.2Pd(Ti - 15Zr - 4Nb - 2Ta - 0.2Pd)
가	가 Ti - 6Al - 4V
. Thompson 11)	ELI
Ti - 6Al - 4V bone marrow	가 Ti - 6Al - 4V ELI
stem cells juvenile rats	5% hydrochloric acid
osteocalcin 가	20 - 50µg/cm ² /day Ti - 6Al - 4V
가	ELI 1300µg/cm ² /day
Ti - 6Al - 4V	Zirconium Niobium
bone marrow stem cells	

Niobium

가

가

swaging

가

가

가

가

가

V.

Zirconium

1.

Ti - Zr - Nb 3

가

Ti - Zr - Sn - Nb 4

가

Titanium - 13Zirconium - 6Niobium
31.59Ncm ± 15.66, Titanium -
6Aluminum - 4Vanadium 25.27Ncm ±
13.14, Titanium - 6Zirconium - 6Sn -
6Niobium 37.44Ncm ± 11.67

Ti

-

가

Ti -

6Al - 4V

²³⁾.

2.

(Ti - 6Al - 4V)
2

(Ti - 13Zr - 6Nb)

(Ti - 6Zr - 6Sn - Nb)

Ti - 6Al - 4V 3

(p<0.05, Wilcoxon Signed
Rank Test).

3.

(Ti - 6Zr - 6Sn - Nb)

가 가

Ti - 6Al - 4V

(

Titanium - 13Zirconium - 6Niobium
53.09% ± 13.56, Titanium -
6Aluminum - 4Vanadium 46.47% ±
8.90, Titanium - 6Zirconium - 6Sn -
6Niobium 47.21% ± 12.97

1).

(Ti - 13Zr - 6Nb) 가

(2).

가

4.

Ti - 13Zr - 6Nb

Ti - 13Zr - 6Nb

(Ti - 6Al - 4V)

Ti - 13Zr - 6Sn - 6Nb

가

Ti - 13Zr - 6Nb

(p>0.01, Wilcoxon Signed Rank
Test).

가

(Ti - 13Zr - 6Nb)

Ti - 13Zr -

Ti - 6Al - 4V

6Nb

Ti - 6Al - 4V

(Ti - 13Zr - 6Sn - 6Nb)

absence of wear. Oct;17(20):1937 - 1942, 1996.

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- Abstract -

Quantitative investigations of titanium alloy implants

Chong Hyun Han*, Seong Joo Heo**, Young Ku***, Young Chang Choi****, Chong Pyong Chung***, Chung Keun Park*****

*Dept of Prosthodontics, College of Dentistry, Yonsei University

**Dept of Prosthodontics and Dental Research Institute, College of Dentistry, SNU

***Dept of Periodontics, and Dental Research Institute, College of Dentistry, SNU

****Dept of Dentistry, Medical School (St. Mary Hospital), Catholic University

*****Dept of Materials Science and Engineering, KAIST

Screw shaped implants of Titanium - 13Zirconium - 6Niobium(newly developed), Titanium - 6 Zirconium - 6 Sn - 6Niobium(newly developed) and Titanium - 6Aluminum - 4Vanadium were machined with square top and inserted in rabbit bone for 3 months. Biomechanical tests (removal torque) showed Titanium - 13Zirconium - 6Niobium and Titanium - 6Zirconium - 6Sn - 6Niobium to be more stable in the bone bed than those of Titanium - 6Aluminum - 4Vanadium. Titanium - 13Zirconium - 6Niobium implants demonstrated a mean removal torque of 31.59Ncm while Titanium - 6Aluminum - 4Vanadium demonstrated a mean removal torque of

25.27Ncm and Titanium - 6Zirconium - 6Sn - 6Niobium revealed a mean removal torque of 37.44Ncm and were statistically significance in Wilcoxon Signed Rank test ($P < 0.05$). Histomorphometrical comparisons were performed on 10 μm thick undecalcified ground sections in the light microscope and Titanium - 13Zirconium - 6Niobium showed more mean bone - to - metal contact ratio than to other two titanium alloys but had no statistically significant differences were found among the three materials ($P > 0.01$).

Key words : titanium, alloy, removal torque, histomorphometry