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Orthopedic & Musculoskeletal System

Highlights

- Idiopathic Trigger Finger
- Insoluble Corticosteroid Injections
- Antibiotic-Loaded Resorbable
- Cementless Total Knee Arthroplasty

Discovering Thoughts, Inventing Future

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Comparison of the Short-Term Treatment Outcome among Watchful Waiting, and Soluble and Insoluble Corticosteroid Injections in Idiopathic Trigger Finger

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Abstract- Objectives: This study aimed to compare the short-term result of local corticosteroid injections in the treatment of idiopathic trigger finger between previously reported proper amount of soluble and insoluble steroids; dexamethasone sodium phosphate and triamcinolone acetonide, and also aimed to compare these results with that of the patients who did not undergo the corticosteroid injection as control group.

Methods: Fifty-six patients (16 men and 40 women; age, 38–79 years; mean age, 60.0 ± 8.8 years) who initially diagnosed with idiopathic trigger finger in our clinic were assigned to watchful waiting, local injection of triamcinolone acetonide (insoluble preparation), or that of dexamethasone sodium phosphate (soluble preparation). The examined digits included 30 thumbs and 1 index, 17 middle, and 8 ring fingers. All patients scored the visual analogue scale (VAS), and were graded according to clinical findings at the timing of initial diagnosis and four weeks following the diagnosis. Statistical analyses focused on the difference of the VAS score and clinical grades between initial and the 4-week evaluation in each treatment group, and also on the comparison of these difference among treatment groups.

Keywords: trigger finger; corticosteroid injection; triamcinolone acetonide; dexamethasone sodium phosphate.

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Comparison of the Short-Term Treatment Outcome among Watchful Waiting, and Soluble and Insoluble Corticosteroid Injections in Idiopathic Trigger Finger

Junko Sato [α], Yoshinori Ishii [σ] & Hideo Noguchi [ρ]

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Results: Whereas the VAS score significantly improved in two injection groups, a significant difference in the improvement of the VAS score and clinical grade was revealed between the group of triamcinolone acetonide and other two groups. We could not find any advantages in the injection of dexamethasone sodium phosphate comparing with watchful waiting.

Conclusions: The injection of triamcinolone acetonide in idiopathic trigger finger had better short-term outcome when comparing with the injection of dexamethasone sodium phosphate and watchful waiting.

Keywords: trigger finger; corticosteroid injection; triamcinolone acetonide; dexamethasone sodium phosphate.

I. Introduction

Corticosteroid injections are commonly used in the management of trigger finger. In general, they have been recognized as considerable first lined treatment before the patients decide to undergo surgery, with the expectation of 60% effectiveness in relieving pain of idiopathic trigger finger[1,2].

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Corticosteroid injections can be easily performed without specialized technique in outpatient clinic; it was reported to have no difference in effectiveness between intrasheath and subcutaneous injections[3].

Injectable steroid preparation can be roughly classified into two categories; soluble or insoluble formulations. Soluble forms tend to diffuse rapidly from injection site and to exert a higher degree of systemic effects when compared to insoluble formulations, whereas insoluble forms aggregate to be crystal formation and have theoretical advantage being longer duration of effect[4]. On the other hands, crystal deposits that remain in the tendon sheaths might disrupt smooth gliding, leading to suboptimal function[5]. Treating physician should be also aware of previously reported adverse events including tendon rupture[6], flare reaction[7], and the atrophy of subcutaneous fat[8] which are more commonly associated with insoluble steroid injection. Ring et al. randomized 84 patients to receive either triamcinolone (insoluble preparation) or dexamethasone (soluble preparation), and triamcinolone had a more rapid but less durable effect[9].

In this study, we aimed to compare the short-term result of local corticosteroid injections in the treatment of idiopathic trigger finger between previously reported proper amount of soluble and insoluble steroids; dexamethasone sodium phosphate and triamcinolone acetonide. We also aimed to compare these results with that of the patients who did not undergo the corticosteroid injection as control group.

II. Methods

The institutional review board approved this study protocol. All patients were informed of the study aims and procedures and signed a consent form that included a description of the protocol. During the period from January 2014 to August 2015, consecutive patients clinically diagnosed with idiopathic trigger finger in our clinic were recruited. Patients with multiple trigger fingers, diabetes mellitus, rheumatoid arthritis, dialysis treatment, fingers with a history of local gouty/pyogenic disease, major hand trauma, prior treatment in other

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institute were excluded from this study. Plain radiographs were evaluated in all patients. We confirmed that none of the included patients had a history of trauma, tumors, calcium deposits, or severe osteoarthritis.

At the time of initial diagnosis, each patient scored the visual analogue scale (VAS) to assess their subjective pain using measuring equipment. Patients were asked to make a mark on a line between the two extremes of complete painless and the maximum pain they could imagine. The distance of entire line was of 100 mm, and the score was measured as the distance between complete painless and the point they marked. In addition, each finger was graded according to clinical findings, resulting in four groups10. Grade I represented a vague sense of tightness and tenderness around the metacarpophalangeal joint, and patients did not exhibit triggering; grade II represented intermittent triggering; grade III represented continuous triggering with or without interphalangeal (IP) joint contracture and locking reduced with active extension; and grade IV represented continuous triggering with or without IP joint contracture. Grade IV patients required passive assist to achieve maximal extension and could not completely flex actively.

We separated the affected digits into the group of thumb and other digits to equalize the number of each finger in the study cohort using a quasirandomized approach as below. In each group, one of the following treatments was assigned to each affected digit in the order of (1), (2) and (3) according to the new diagnosis of idiopathic trigger finger, and this process was repeated; (1) watchful waiting without local corticosteroid injection, (2) local injection of the mixed preparation of triamcinolone acetonide (Kenacort-A 50mg/5mL, Bristol-Myers Squibb K.K, Japan) 1mg/0.1mL and 1% Mepivacaine Hydrochloride (Carbocain Injection 1%, AstraZeneca K.K, Japan) 0.9mL, (3) local injection of the mixed preparation of dexamethasone sodium phosphate (Orgadrone Injection 1.9mg, MSD K.K, Japan) 3.8mg/1.0mL and 1% Mepivacaine Hydrochloride (Carbocain Injection 1%) 0.5mL. With regards to the proper amount of each corticosteroid injection, we referred to the description of previous review article (Dahl and Hammert, 2012); proper dosages for the small joint such as finger and wrist is 4-10 mg in dexamethasone sodium phosphate, and 0.8-1.0 mg triamcinolone acetonide, respectively. The injections were performed at the timing of initial diagnosis, and placed into and around the flexor sheath using a 27-gauge needle at the level of the A1 pulley. All patients were also recommended joint stretching of the affected digit and activity modification if they had overused their affected hand. They were explained to revisit our clinic for reevaluation with a 4- week interval following the injection regardless of the improvement or exacerbation of their symptoms. In the reevaluation, the same measurement of the VAS score and same clinical grading with initial evaluation were performed. All diagnoses, evaluations and corticosteroid injections were performed by a senior hand surgeon with 15 years of experience in surgery.

As a result, 56 patients (16 men and 40 women; age, 38–79 years; mean age, 60.0 ± 8.8 years) who actually revisit our clinic at four weeks after initial visit were evaluated in statistical analyses. The examined digits included 30 thumbs and 1 index, 17 middle, and 8 ring fingers.

We confirmed there was no difference in patients' initial symptom among treatment groups using the Kruskal-Wallis test for the VAS score and Friedman test for the clinical grade, respectively. With regards the treatment outcome, statistical analyses focused on the difference of the VAS score and clinical grades between initial and the 4-week evaluation in each treatment group, and also on the comparison of these difference among treatment groups. On the comparisons among treatment groups, we calculated the improvement of the VAS score using the following formula; [(reevaluated VAS score – initial VAS score) / initial VAS score] x 100 %, and also classified each digit into three groups according to the change of clinical grade; (1) improved (2) unchanged (3) exacerbated. Comparisons of the VAS score and the improvement of the VAS score were performed using the Wilcoxon signed-ranks test in each treatment group and using the Kruskal-Wallis test and Sheffe's F test among treatment groups. Comparisons of clinical grades and their changes were performed using the Mann-Whitney U test. Results were deemed significant if $P<.05$.

III. Results

Table 1 presents the patients' demographics and finger information in each treatment group. No patients who had injection revealed steroid-induced adverse event. There was no difference in patients' initial VAS score and clinical grade among treatment groups. Figures 1 and 2 present the results of the VAS score and the improvement of the VAS score, respectively. In the groups of triamcinolone acetonide and dexamethasone sodium phosphate, the VAS score significantly improved at the 4-week evaluation. There was a significant difference in the improvement of VAS score between the group of triamcinolone acetonide and other two groups. Table 2 presents the result of clinical grading at initial and the 4-week evaluation. At the 4-week evaluation of clinical grade, three digits were improved, 12 digits were unchanged, and three digits were exacerbated in the group of watchful waiting. In the group of triamcinolone acetonide, 15 digits were improved, two digits were unchanged, and no digits were exacerbated. In the group of dexamethasone sodium phosphate, seven digits were improved, nine digits were unchanged, and

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five digits were exacerbated. With regards to the change of clinical grade, there was a significant difference between the group of triamcinolone acetonide and other two groups ($P<.01$), and there was no difference between the group of watchful waiting and that of dexamethasone sodium phosphate.

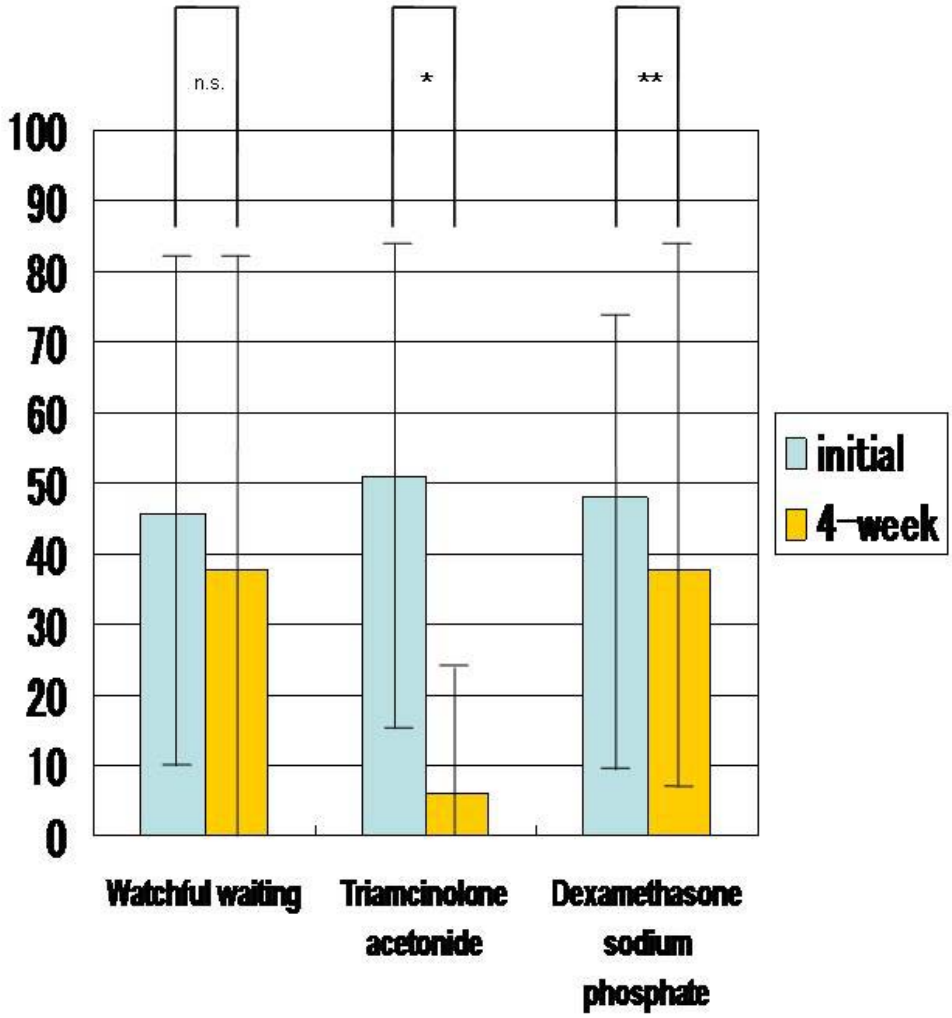

Figure 1 : The results of the VAS score.

* P<.01, ** P<.05, n.s.: not significant. Statistical significance was examined by the Wilcoxon signed-ranks test.

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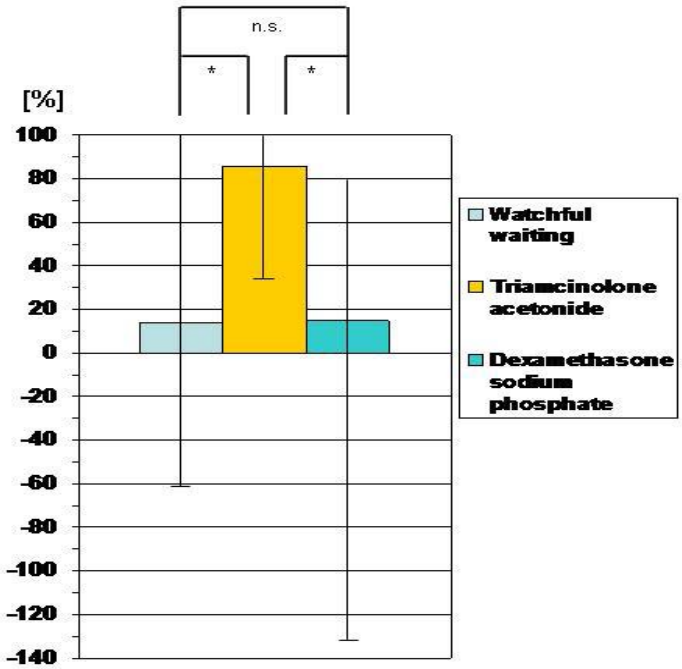

Figure 2 : The results of the improvement of the VAS score.

* P<.01, n.s.: not significant. Statistical significance was examined by the Sheffe's F test.

Table 1 : Patients demographics and finger information

Finger information					
	Gender (male/female)	Age (years)	(right/left)	(d/nd)*	(T/I/M/R)**
Watichful waiting	5/13	58 (SD 8)	9/9	10/8	8/1/7/2
	-	(40-73)			
Triamcinolone acetonide	4/13	65 (SD 8)	11/6	13/4	10/0/5/2
		(51-79)			
Dexamethasone sodium phosphate	7/14	58 (SD 9)	11/10	12/9	12/0/5/4
		(38-75)			

A number of the patient and affected digit is described in the box of gender and finger information. The mean value (standard deviation), and value range is described in the upper and lower box of age, respectively.

* dominant hand/non dominant hand
** thumb/index finger/middle fingr/ring finger

Table 2 : Clinical grade at initial and the 4-week evaluation

Grande					
	N/A*	I	II	III	IV
Initial evaluation					
Watichful waiting	-	4	8	6	0
Triamcinolone acetonide	-	3	4	6	4
Dexamethasone sodium phosphate	-	0	9	8	4
4-week evaluation					
Watchful waiting	1	3	9	3	2
Triamcinolone acetonide	5	5	4	3	0
Dexamethasone sodium phosphate	2	5	6	6	2

A corresponding number of the affected digit are described in the box.

*N/A represents "not applicable". There is no vague sense of tightness and no tenderness around the MP joint, and patients did not exhibit triggering.

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IV. Discussion/Conclusion

In this study comparing two corticosteroid injections for idiopathic trigger finger in previously described proper dose, local injection of triamcinolone acedonide was significantly more effective than that of dexamethasone sodium phosphate at the 4-week evaluation. At this point, we could not find any advantages in the injection of dexamethasone sodium phosphate comparing with watchful waiting without injection.

We have several limitations in this study. First limitation is small number of patients. Secondly, the assignment of treatment was a quasirandomized and control patients did not underwent placebo injection in our study. Third, we did not consider the cost effectiveness and adverse events in each corticosteroid. We deeply recognize that a treatment that is more effective but has higher cost and higher complication rate may not be the best option.

Local corticosteroid injection has been popular treatment of trigger finger by its simplicity, applicability in an office setting, and low cost[11]. A review of level I and II studies reported one corticosteroid injection were effective in relieving pain in 57% of the patients with trigger finger1. In the study of long-term follow up in one year of 130 patients with trigger finger who underwent corticosteroid injection of 40mg triamcinolone, younger age, insulin-dependent diabetes mellitus, involvement of multiple digits at the time of injection, and a history of other tendinopathies of the upper extremity were associated with a higher rate of failure; they were all independent predictors of a future surgical release[12].

Soluble steroid forms are salt formulations that are freely water-soluble, have a clear, nonparticulate preparation. They tend to diffuse rapidly from injection site and to exert a higher degree of systemic effects when compared to insoluble formulations. Insoluble steroid forms contain esters that cause them to be highly insoluble in water, which causes aggregation and crystal formation. Insoluble compounds require hydrolysis by host esterases to release the active compounds, with the theoretical advantage being longer duration of effect4. In the previous study of short- and middle-term follow up in the 84 patients with idiopathic trigger finger randomly underwent the injection of dexamethasone or triamcinolone[9], triamcinolone had significantly better absence of triggering rates, clinical grades, and patient satisfaction at the 6-week evaluation but not at the 3-month evaluation. Ring et al included the patients with diabetes and multiple digit involvement in order to increase the generalizability whereas we did not include these patients. In addition, we used dexamethazone sodium phosphate as soluble preparation and triamcinolone acetonide as insoluble preparation. Triamcinolone acetonide is a more potent derivative of triamcinolone, and we used 1 mg triamcinolone acetonide which is smaller amount comparing with the 5-7.5 mg triamcinolone used in the study of Ring et al.

Insoluble corticosteroids such as triamcinolone acetonide might be more prone to adverse events. The most common side effect is known as post-injection flare, which is thought to be the result of an acute inflammatory response to the injected steroid ester crystals[13,14], and can occur in up to 33% of patients with trigger finger or de Quervain's disease who underwent extra-articular steroid injection[7]. Subcutaneous atrophy is more commonly associated with insoluble compounds[15]. Direct intratendinous toriamcinolone injection has been associated with tendon rupture, likely due to an inhibitory effect on tenocyte function, and should be avoided[16]. Dexamethasone sodium phosphate is about 5.3 times as potent as triamcinolone acetonide; equivalent dose is 7.5 mg in dexamethasone sodium phosphate and 40 mg in triamcinolone acetonide, respectively[4]. However, the comparison of effectiveness among two different corticosteroid injections and watchful waiting showed better outcome in the injection of triamcinolone acetonide although the current study evaluate only the short-term outcome in four weeks. Small amount of insoluble steroid might be also safe in the current study despite of previous high rate steroid-induced adverse event.

In conclusion, the injection of triamcinolone acetonide in idiopathic trigger finger had better short-term outcome when comparing with the injection of dexamethasone sodium phosphate and watchful waiting without injection either on the improvement of patients' pain and triggering. At least, its effectiveness might be expected to continue for four weeks. This information might be useful in the decision of treatment and the choice of steroid preparation.

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Declaration of Conflicting Interests

All authors declare no conflict of interest in preparing this article.

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Evaluation of the Quantification of Bone Ingrowth and the Influence of Stress Shieldings in Cementless Total Knee Arthroplasty: A Prospective Case â€"Control Study

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Abstract- Objectives: There have been no manuscripts to compare the bone ingrowth between CR type (Cruciate Retaining) and PS type (Posterior Stabilized) of cementless total knee arthroplasty(porous tantalum metal modular tibial component) and evaluate by imaging the postoperative computed tomography. The purpose of this study was to clarify and compare the bone ingrowth under the peg of porous tantalum modular tibial component between CR and PS.

Methods: A consercutive series of 46 total knee arthroplasties (CR:23,PS:23) were reviewed prospectively. We was divided mediolaterally into six regions under the peg of tibial component and analyzed bone mineral content/total volume (BMC/TV)values using 3D osteomorphometry software with MDCT under lower the knee every 3 months(follow-up:21 months).

Keywords: porous tantalum modular tibia cementless total knee arthroplasty analysis of three-dimensionally osteomorphometry bone mineral content/total volume (BMC/TV) values stress shielding.

GJMR-H Classification: NLMC Code: WE312

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Takao Kaneko [α], Takahiro Otani [σ], Takahide Sunakawa [ρ], Nobuhito Nango [ω], Hiroyasu Ikegami [¥] & Yoshiro Musha [§]

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Results: There were significantly higher BMC/TV values for PS typethan CR type at ROI.2.4.6 (Lateral, Lateral-Anterior, Lateral-posterior) at 3.18.21 months postoperatively. There were not a significant difference in the relative change in BMC/TV values in ROI.1.3.5 (Materal, Materal-Anterior, Materal-Posterior).

Conclusions: The study indicated that PS type associated with the post-cam mechanism and midflextion instability was caused reactive cancellous stabilized and not occrred the influence of stress shieldings in lateral site under the peg of tibial component than CR typepost-operatively18 months later.

Level of evidence Ⅲ-

Keywords: porous tantalum modular tibia cementless total knee arthroplasty analysis of three-dimensionally osteomorphometry bone mineral content/total volume (BMC/TV) values stress shielding.

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I. Introduction

Cemented total knee arthroplasty has been considered the accepted standard with predictable and durable results [3.4.8.9.10.16. 21.22.25.28.29]. Cementless total knee arthroplasty have induced preservation of bone stock, shoter operating time, ease of revision. Porous tantalum has been introduced as metallic implant material for total knee arthroplasty. The high volumetric porosity (70 ～ 80%), low modulas of elasticity (3～4 MPa), and high friction characteristics of trabecular metal make it conducive for biological fixation [17]. Many groups have reported satisfactory outcomes with cementless total knee arthroplasty using trabecular metal monoblock tibial components that contain porous tantalum as the primary material[5.9.14.18. 24.34].All reports was used trabecular metal monoblock and radiostereometric results for stastical analysis. No manuscript were evaluated by imaging the postoperative computed tomography. We hypothesized that trabecular metal modular type (posterior stabilized type: PS type) is affected the influence of stress shielding with mid flextion instability. The aim of present study was to compare the bone ingrowth under the peg of trabecular metal modular tibial component between cruciate retaining type (cruciate retaining: CR type) and PS type.

II. Material and Methods

From October 2011 to April 2013, 46 primary total knee arthroplasties were perfomed in 46 patients with porous tantalum modular tibial component (Trabecular Metal; Zimmer, Warsaw, IN). We divided CR and PS type selectively. In all cases, the TKA surgical procedure was performed by one author (T. K.) and was minimally invasive surgery, with a skin incision of 8-11 cm. Patient walking was permitted from the day following the operation. The Knee Society Score (KSS) and The Western Ontario Mcmaster Universities Osteoarthritis Index (WOMAC) were measured preoperarively and up to two years postoperatively by two authors (T.K and T.O). Some case in which

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postoperative simple X-ray examination and, 3D Planning reposition simulation postoperative evaluation (ZedKnee: LEXI. Co., Ltd, Tokyo. Japan) showed malalignment and, cases was excluded from the analysis. We dicided that inclusion criteria was that all cases of tibial component alignment was within 3°varus-valgus to neutral alignment. For determination of the ossification density at 3,6,9,12,15,18,21 months post-operatively, a phantom(Taisho-Toyama Pharm. Co., Ltd, Tokyo. Japan) consisting of a cylinder composed of a material corresponding to cortical bone and filled with a material having a bone density corresponding to cancellous bone was placed under the knee (Fig. 1), and imaging was then performed by multi detector-row computed tomography (MDCT). From the obtained images, the cancellous trabecular structure was visualized three-dimensionally with 3D osteomorpho-metry software (TRI/3D-BON64; RATOC System Engineering Co., Ltd., Tokyo, Japan), and the structural parameters were calculated (Fig. 2). The structural parameters subjected to analysis were those recommended by the American Society for Bone and Mineral Research [19]: bone mineral content/total volume (BMC/TV) values, representing mineralized bone volume as a percentage of total volume. In the assessment of BMC/TV values by MDCT imaging of the proximal tibia, the joint prosthesis itself generated artifacts, which prevented accurate delineation. Therefore, the overall region was divided into 6 regions of interest (ROIs), consisting of two cylindrical volumes, each 16 mm in diameter and 8 mm in height, with their tops 0.6 mm below the medial or lateral peg, with each further divided into 2 half-cylinders. [ROI. 1 (Medial), ROI. 2 (Lateral), ROI. 3 (Medial-Anterior), ROI. 4 (Medial-Posterior), ROI. 5 (Lateral-Anterior), and ROI. 6 (Lateral-Posterior) (Fig.3). Statistical analysis(SPSS version 17.0 software: SPSS, Chicago, IL, USA) was performed for relative change in ossification density ,immediately and after surgery every 3 months in each of the two groups by the Mann-Whitney U test and for comparison between the two groups by the paired t-test. P values of less than 0.05 were considered significant .This study of these patients was approved by the Institutional Review Board and they were informed of the risk of radiation exposure required

III. Results

No significant difference was recognized in age and Body mass index, gender, knee society score, between two groups before the operation (Table. 1).No osteoporosis therapeutic agent was administered in the two groups .There were no significant difference in KSS and WOMAC at 1-year follow-up between the two groups (Table. 2). No prosthetic fracture and prosthetic migration and prosthetic infection were detected during the follow-up periods. At 3.6.9.12.15.18.21 months after operation, the BMC/TV values in ROI. 1 (Medial) was no significant difference in the two groups (Fig .4). The BMC/TV values in ROI. 2 (Lateral) was significant higher in PS type than CR type at 3 and 18. 21 months after operation ($p<0.01$, $p<0.05$. Fig .5).

The BMC/TV values in ROI. 3 (medial- anterior) and ROI.4 (Medial- Posterior) was no significant difference in both group at all periods after operation (Fig .6.7). The BMC/TV values in ROI.5 (Lateral-Anterior), and ROI.6 (Lateral-Posterior) was significant higher in PS type than CR type at 3.18.21 months after operation ($p<0.01$, $p<0.05$. Fig. 8.9).

IV. Discussion

There were many manuscripts comparing stemmed cemented versus porous tantalum trabecular metal monoblock tibial component. No significant difference was recognized in KSS score WOMAC, radiographic results, complication and radiostereometric analysis migration between two groups [9.24.27]. Previous studies have shown a decrease in bone mineral density in the proximal part of the tibia after cemented total knee arthroplasty [20.26.31.32.33]. But the decrease in relative bone mineral density in the lateral part of the tibia was significantly less in the group treated with the porous tantalum monoblock tibial component than in the group treated with cemented tibial component up to five years after the operation [23]. Porous tantalum trabecular metal tibial component have been proposed to address looseing due to stress shieldings and breakdown of the cement mantle, in spite of first cementless tibial component includes looseing, particle migration through screw holes, and particle induced ostolysis[1.2.6.7.15.19]. Trabecular metal tibial component exists of monoblock type and modular type. The monoblock type consists of a porous tantalum ingrowth surface compression molded into it and two hexagonal porous tantalum pegs for initial stability. The modular type consists of a titanium alloy modular tray with a porous tantalum layer that also includes two hexagonal pegs and includes a central boss (small circular peg) in the central posterior of the tray that is used with a lock down screw [11]. Early migration for porous tantalum monoblock tibial component was not continue but soon stabilized [12]. Porous tantalum increased initial stability and accerated bone ingrowth and retented of bone stock through reduced stress shielding [20]. The flexibility of porous tantalum modular tibial component plate may produce radiolucencies at higher rate and it exhibited higher bone ingrowth than porous tantalum monoblock tibial component and implantation time was positively correlated with bone ingrowth for monoblock tibial components [13.30].We evaluated the bone mineral content/total volume (BMC/TV) values between CR and PS type of porous tantalum modular tibial component up to twenty one

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months. In the current study, No manuscript were evaluated the BMC/TV values of CR and PS type by imaging the postoperative computed tomography.

The relationship between CR and PS type had the same factor for postoperative activites and accuracy position of total knee arthroplasty. There were siginificantly higher BMC/TV values for PS type than CR type in ROI.2.4.6 (Lateral, Lateral-Anterior, Lateral-Posterior) at three and eighteen , twenty one months after operation. We did not find a significant difference in the relative change in BMC/TV values in ROI.1.3.5 (Materal, Materal-Anterior, Materal-Posterior) between PS and CR type postoperatively. The presents study suggests that PS type associated with the post-cam mechanism was caused reactively higher BMC/TV values than CR type, associated with bone sclerotic change in medial tibial plateau for medial knee osteoarthritis at 3 months. We discussed that trabecular metal modular tibia (PS type) with midflextion instability was caused reactive cancellous stabilized and not occurred the influence of stress shieldings in lateral site under peg of tibial component than CR type, post-operative 18 months later. The present study had several limitations that should be considered. First, this study was prospective study, but patients could not be randomized. Additional research is required to determine the long-term benefits of porous tantalum modular tibial component for CR and PS type. Second, there are a relatively small size with short term follow up. Thid, computed tomography was not perfomed before operation, furthermore BMC TV values was not measured in view of radiation exposure. In present study we recongnized that trabecular metal modular tibia (PS type) was not affected the influence of stress shieldings.in spite of than CR type, post-operative 18 months later to 21 months.

V. Conclusions

This study revealed that trabecular metal modular tibia (PS type) with midflextion instability was caused reactive cancellous stabilized and not occurred the influence of stress shielding in lateral site under peg of tibial component than CR type postoperative 18 months later.

VI. Acknowledgments

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Conflict of interest

The authors declare to conflict of interest.

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Table 1 : Pre-operative clinical data

Subject preoperative data	CR type (n=23)	PS type (n=23)	P value
Age.mean ± SD years	75.4 ± 5.2	76.1 ± 4.8	0.328
Sex (women/men)	22 / 1	22 / 1	>0.999
BMI,mean ± SD kg/m²	26.3 ± 2.2	25.2 ± 3.1	0.253
Knee Society Score Knee ± SD points Function ± SD points	51.2 ± 9.6 44.2± 7.2	48.6 ± 10.2 45.9 ± 8.4	0.321 0.289
Femoro-tibial angle ± SD degree	192.1 ± 9.2	190.9 ± 8.1	0.271

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Table 2 : Post-operative clinical data at 1-year follow up

Subject preoperative data	CR type (n=23)	PS type (n=23)	P value
Knee Society Score Symptoms(25) Patient satisfaction(40) Patient expectation(15) Functional activities(100) ± SD points	 18.3 ± 4.3 23.3 ± 8.8 9.24 ± 3.2 61.4 ± 14.2	 20.1 ± 4.4 24.1 ± 8.1 10.1 ± 2.8 64.1 ± 16.9	 0.328 0.420 0.364 0.348
WOMAC Score Pain(20) Stiffness(8) Daily activities ±SD points	 12.3 ± 5.8 6.71 ± 1.2 48.7± 14.2	 11.6 ± 6.0 5.89 ± 1.8 47.3± 13.9	 0.410 0.483 0.332
Hip-Knee- Ankle angle ±SD angle	178.2 ± 2.3	177.9 ± 1.7	0.509
Condylar-twist angle(CTA) ±SD angle	3.47 ± 1.9	3.59 ± 1.1	0.441

Fig. 1 : The phantom(Taisho-Toyama Pharm. Co., Ltd, Tokyo. Japan) consisting of a cylinder composed of a material corresponding to cortical bone and filled with a material having a bone density corresponding to cancellous bone was placed under the knee.

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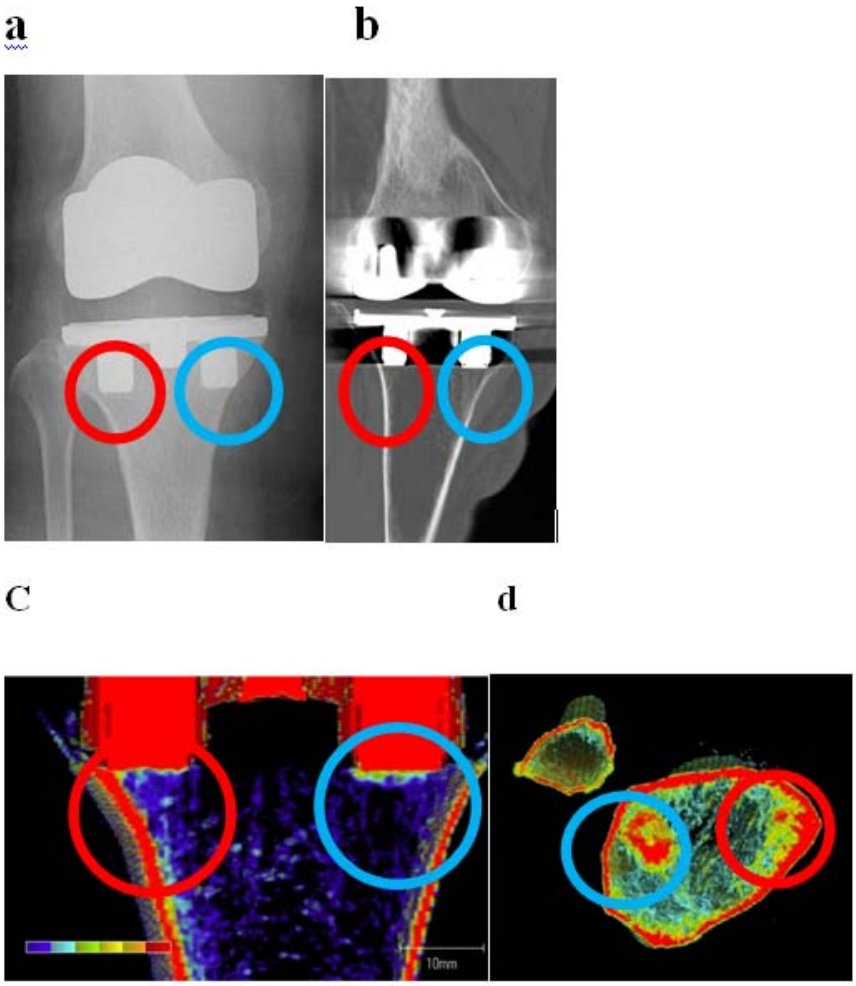

Fig. 2 : The measurement of bone mineral content/total volume (BMC/TV)v alues, representing mineralized bone volume as a percentage of total volume in ROI.1 (medial), ROI.2 (lateral)

a. Postoperative radiograph using trabecular metal modulartibial component (CR type)
b. Coronal plain CT image demonstrating
c. Coronal 2D-MDCT image
d. Axial 3D-MDCT image

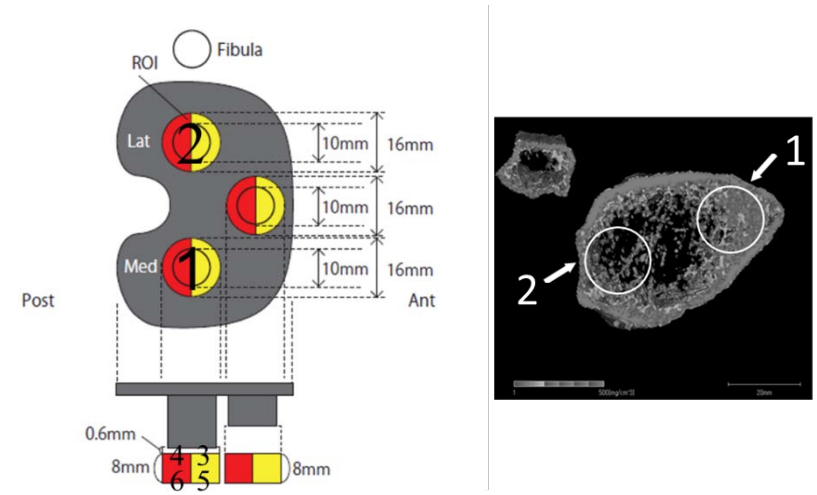

Fig. 3 : 6 Regions of Interest (ROI) under the peg of the tibial component. : Regions 1 (Medial) and 2 (Lateral), and 3 (Medial-Anterior), 4 (Medial-Posterior), 5 (Lateral-Anterior), and 6 (Lateral-Posterior)

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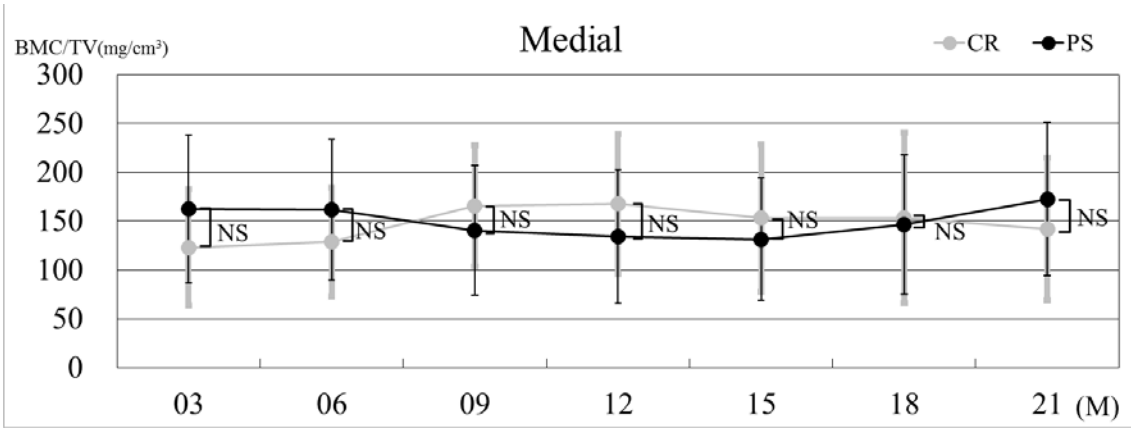

Fig. 4 : The relative change in bone mineral contents/total volume (BMC/TV)values in ROI .1 (Medial) was no significant difference in the two groups.

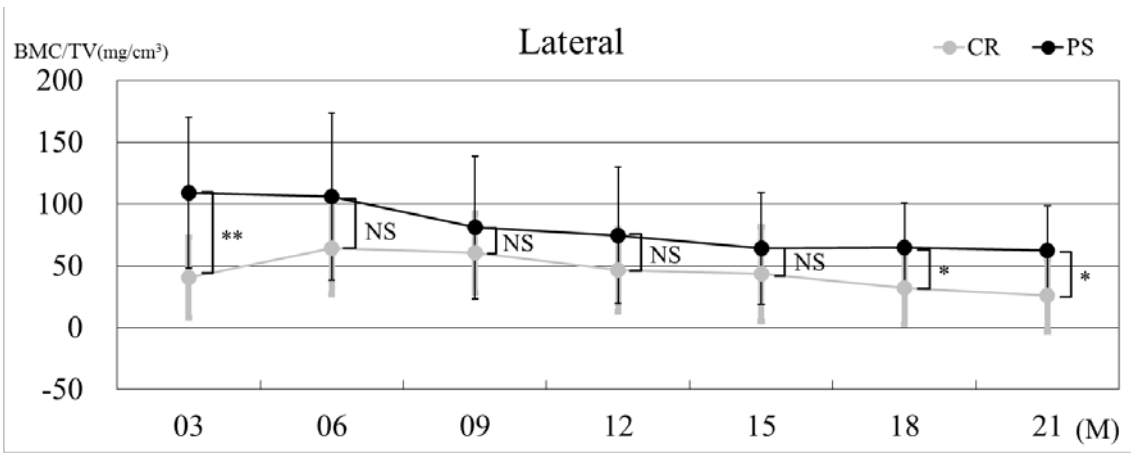

Fig. 5 : The relative change in BMC/TV values in ROI. 2 (Lateral) was significant higher in PS type than CR type at 3.18.21months after operation ($p<0.01$**, $p<0.05$*).

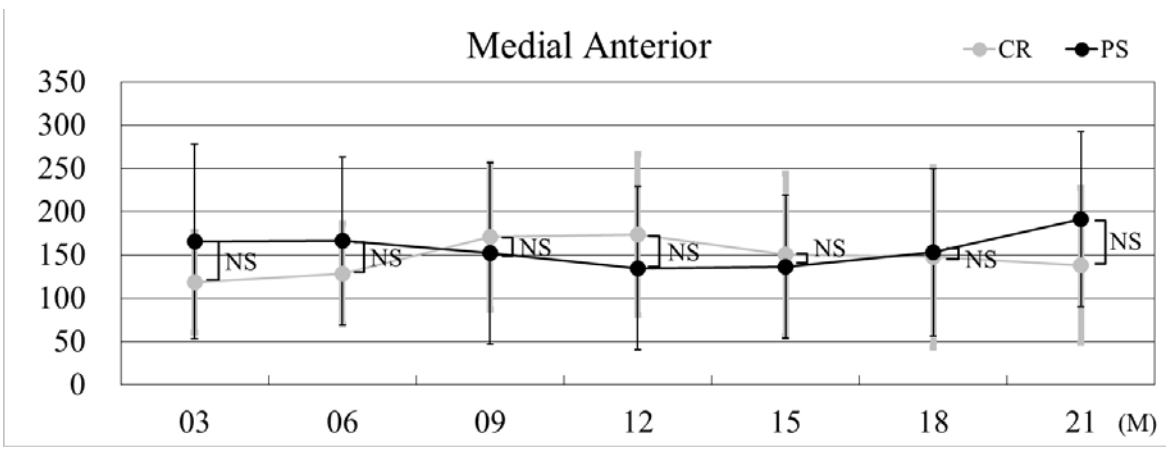

Fig 6 : The BMC/TV values in ROI .3 (Medial-Anterior) was no significant difference in both group at all periods after operation.

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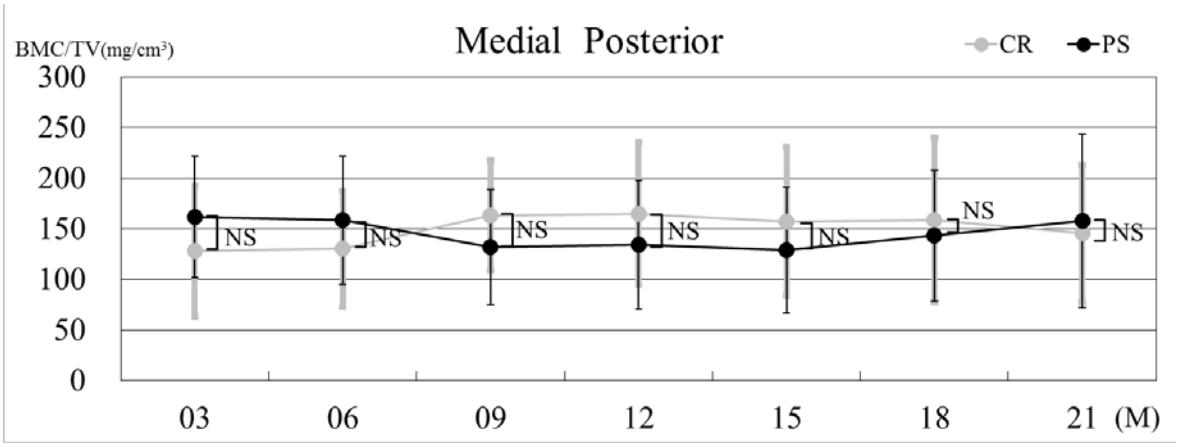

Fig 7 : The BMC/TV values in ROI .4 (Medial-Posterior) was no significant difference in both group at all periods after operation.

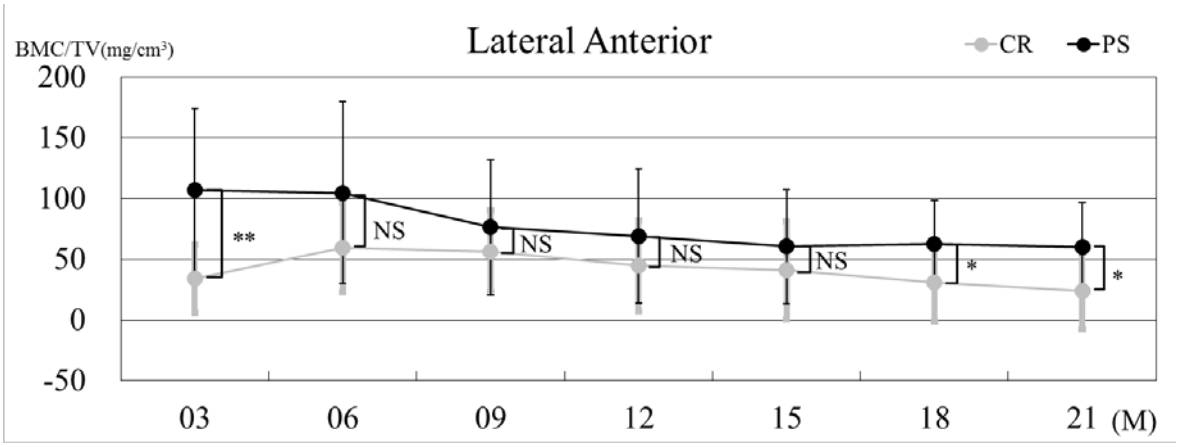

Fig. 8 : The relative change in BMC/TV values in ROI. 5 (Lateral-Anterior) was significant higher in PS type than CR type at 3.18.21 months after operation ($p<0.01$**, $p<0.05$*).

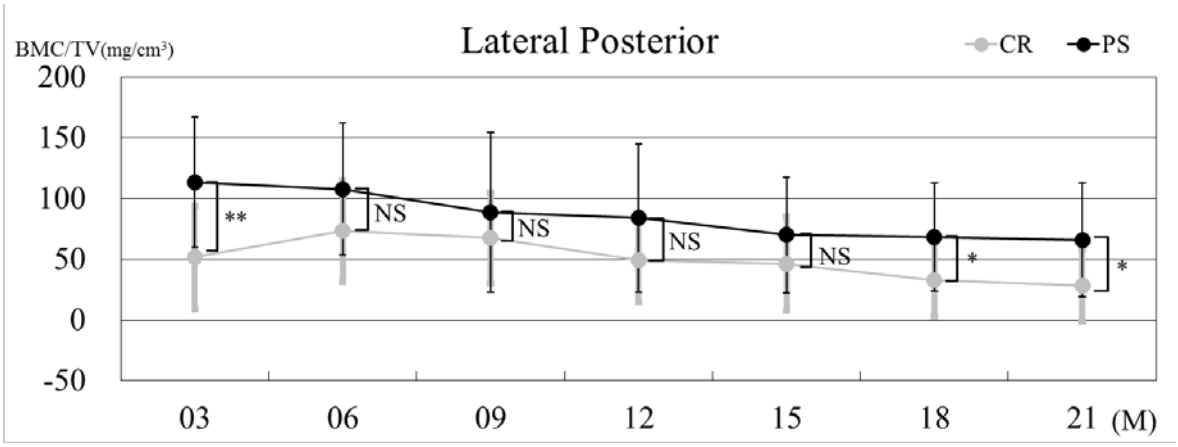

Fig. 9 : The relative change in BMC/TV values in ROI. 6 (Lateral-Posterior) was significant higher in PS type than CR type at 3.18.21 months after operation ($p<0.01$**, $p<0.05$*).

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Antibiotic-Loaded Resorbable Bone-Graft Substitute: A New Treatment

By Dr. Med. Bernd Gächter, Dr. Med. Jennifer Frieda Angehrn, Dr. Med. Stephane Schlunke, Prof. Dr. Sebastian Probst & Dr. Med. Paul Biegger

Introduction- Patients with osteomyelitis of the long bones need a surgical debridement with a long-term antibiotic therapy. This is always a great challenge. This patient group has usually a long hospitalization period, high therapy costs and a great risk of a recurrence. Patients often interrupt independently the long-term antibiotic therapy because of side effects. Patients with osteomyelitis do have many multiple comorbidities like diabetes mellitus or arthropathy which doesn't favor the healing process of the wound. The immune system of this patient group is often compromised due to cortisone treatment or an infectious disease. Some of these patients live at the margins of our society with addiction and psychiatric illnesses. Additionally experiences demonstrate that this patient population usually show a very poor compliance.

A simple treatment concept is needed that can be carried out even in patients with poor reliability.

This case report will demonstrate that even after two surgical treatments the healing of the wound was not accomplished. But using the treatment with antibiotic-loaded reservable bone-graft substitute the healing was successful.

GJMR-H Classification: NLMC Code: WE 168

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Antibiotic-Loaded Resorbable Bone-Graft Substitute: A New Treatment

Case Report

Dr. Med. Bernd Gächter [α], Dr. Med. Jennifer Frieda Angehrn [σ], Dr. Med. Stephane Schlunke [ρ]
Prof. Dr. Sebastian Probst [Ω] & Dr. Med. Paul Biegger [¥]

I. Introduction

Patients with osteomyelitis of the long bones need a surgical debridement with a long-term antibiotic therapy. This is always a great challenge. This patient group has usually a long hospitalization period, high therapy costs and a great risk of a recurrence. Patients often interrupt independently the long-term antibiotic therapy because of side effects. Patients with osteomyelitis do have many multiple comorbidities like diabetes mellitus or arthropathy which doesn't favor the healing process of the wound. The immune system of this patient group is often compromised due to cortisone treatment or an infectious disease. Some of these patients live at the margins of our society with addiction and psychiatric illnesses. Additionally experiences demonstrate that this patient population usually show a very poor compliance.

A simple treatment concept is needed that can be carried out even in patients with poor reliability.

This case report will demonstrate that even after two surgical treatments the healing of the wound was not accomplished. But using the treatment with antibiotic-loaded reservable bone-graft substitute the healing was successful. The affected bone was resected, the remaining bone was drilled and the antibiotic-loaded bone-graft was filled up. In this way a high dose of local antibiotics could act in the remaining bone for weeks. After a couple of months the reservable bone-graft cannot be detected by means of radiography.

II. Case Presentation

An unemployed 44-year-old man with a history of alcohol and drug abuse and a bipolar disorder which has been assigned to a guardian. He presented himself in our clinic with a proximal fracture of his left humeral shaft after a fall (Figure 1).

Figure 1	Figure 2
Fracture	First post op

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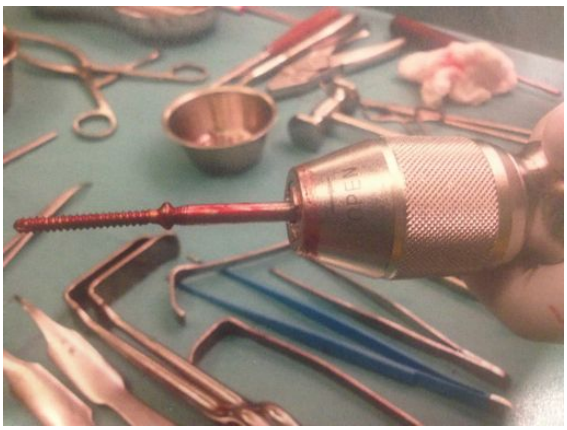
A couple of weeks after the osteosynthesis (Figure 2) patient returns to our emergency room with a dislocation of the plate after an other fall (Figure 3). The patient was operated again with the introduciotn of a new proximal plate (Figure 4). The next six months proceeded uneventful.

Figure 3	Figure 4
Dislocation	Second post op

After this period the patient presented himself again in our wound service with a purulent wound of his left arm that reached deep down up to the osteosynthetic plate (Figure 5).

Figure 5	Figure 6
	
Purulent wound	Removal of osteosynthesis material

The radiography showed a healed fracture. The laboratory findings demonstrate lightly elevated parameters of inflammation (Lc 12.8, CPR 10). In the bacteriological culture the growth of Staphylococcus capitis (sensitiv of gentamicin) was determined. We proceeded with the removal of the metallic plate (Figure 6), took several biopsies for further bacteriological findings, debrided the wound and closed it with a negative pressure device. Every three to four days the negative pressure sponge was changed in the operating theater and the wound was debrided (Figure 7). The biopsies taken didn't show any further bacterial growth and the wound started to granulate so that a secondary wound closure was performed leaving inside a "drainge of redon" which was removed after a few days.

After dismission the patient did not take the resistance tested antibiotics regularly and did not present himself to the scheduled control appointments as agreed.

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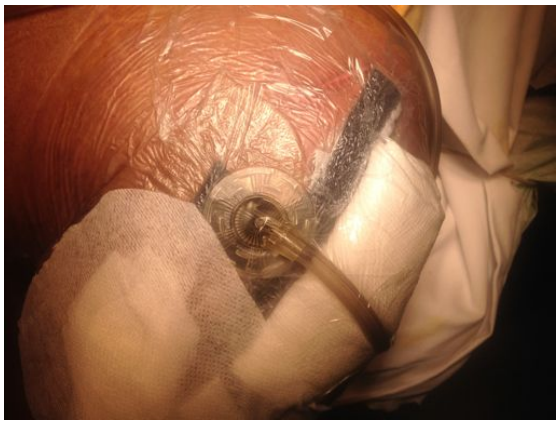
Figure 7	Figure 8
	
Negative pressure therapy	Gentamicin chain therapy

After some time the patient presented himself with a purulent wound again. The radiography did non show any abnormalities. The patient refused to repeat the therapy with the negative pressure device. We debrided the wound thoroughly, took biopsies for bacteriology and placed a gentamicin chain deep into the wound (Figure 8). After several weeks we took out the chain in the operating theater.

Also this second try remained without success. The patient returned again with a secreting wound and in this case the radiography showed an osteomyelitis of the head of the humerus with deformation and missing bone (Figure 9). The classification after Charney was IV.

Figure 9	Figure 10
Rx osteomyelitis	Macroscopic osteomyelitis

We decided to do a one-stage surgical procedure with debridement, drill up the bone (Figure 11) and introduction of the antibiotic-loaded resorvable bone-graft substitute during radiographic control (Rx intra op Figure 12, Rx post op Figure 13). The necrotic part of the humerus head was resected with a radical debridement (figure 10) and at least ten samples were taken for bacteriology and histology. In the bacterological culture the growth of Staphyloccocus epidermidis (sensitive of gentamicin).

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Figure 11	Figure 12
Drill up the bone marrow	Rx intra op: fill in the antibiotic-loaded resorbable bone-graft substitute

We used the Ultrasonic-Assisted Wound Debridement device for cleaning the wound. The wound was closed immediately. The wound secreted a serous fluid for approximately four weeks after that the wound was dry (Figure 14).

Figure 13	Figure 14
Rx post op with antibiotic-loaded resorbable bone-graft substitute	Wound post op

The patient was checked at first in a daily basis, after two weeks the patient was able to go home. The wound was seen every week, after a month every two weeks and after three months every three weeks. An antibiotic therapy for three months was prescribed which was not followed regularly despite the help of a guardian.

The x-ray examination after six months showed a dissolved bone-graft and the formation of a strong bone (Figure 18). And the wound was healed without secreting serous fluid (Figure 17).

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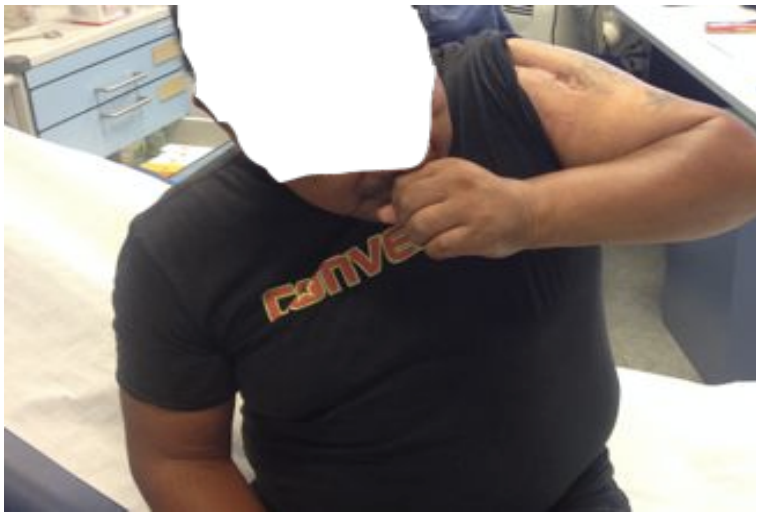
Figure 17	Figure 18
Wound after 6 month	Rx after 6 month: the antibiotic-loaded bone-graft substitute is resorbed

The patient is now able to move his left hand toward his mouth, the abduction of the shoulder is 60° (Figure 18). The internal rotation movement is feasible (Figure 19).

Figure 18	Figure 19
	
Range of motion after 6 month	Range of motion after 6 month

III. Discussion

The need for surgical revision is an enormous burden for the patient and their families as well as for the healthcare system and hospital staff. Any reduction of the hospitalization time, of the complication rates or recurrence rate is especially important in this highly problematic group of patients.

The patient had some serous fluid leak but healed. We found that any excess bone-graft substitute must be completely removed; otherwise there will be prolonged secretion.

We often see that patients do not complete the three-month antibiotic treatment because of side effects such as abdominal pain or nausea, or because of the patients very low reliability. The antibiotic-loaded resorbable bone-graft substitute has an high antibiotic effect locally.

The x-ray examinations during follow-up show that the antibiotic-loaded resorbable bone-graft substitutes has dissolved and strong bone formed. In our patients with humeral head resection a foundation would then be created for a prosthetic replacement by patient with a good compliance.

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To better understand the effectiveness of the therapy a larger numbers of patients must be studied in the future with longer observation periods.

Our experience in this case suggest that antibiotic-loaded reservable bone-graft substitute might help to reduce recurrence rates in this challenging group of patients. The antibiogram in bone biopsy was sensitive to gentamicin. A clarifying question in future studies would be whether oral antibiotic therapy with gentamicin is at all necessary in sensitivity germs at bone biopsy.

IV. Conclusion

Our case report suggests that this new kind of bone-graft could reduce the rates of recurrence and complications in long bone osteomyelitis in one sitting.

An ongoing prospective series is currently being done in our facility that will add additional evidence to help evaluate this hypothesis. Further studies will be required before any definitive statement can be made. The evidence of efficacy of this device in osteomyelitis therapie, combined with the logic of high local antibiotica depot give us reason to be optimistic.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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Bilateral Knee Dislocation with Tibial Shaft Fracture

By Rafik Elafram, Sabri Mahjoub, Emir Bassalah, Ismail Jerbi, Mohamed Abdelkefi, Hedi Annabi, Mehdi Hadj Salah & Mondher Mbarek

Burn and traumatology Center, Tunisia

Abstract- Acute dislocation of the knee is a limb-threatening injury that often results in extensive soft-tissue damage and disruption of the popliteal blood vessels.

We report a case of traumatic bilateral open knee dislocation with a type 42 A2 closed right tibial shaft fracture and right common peroneal nerve palsy.

We are not aware of any other reports of such a combination of injuries.

Keywords: bilateral, knee, dislocation, tibial shaft fracture.

GJMR-H Classification: NLMC Code: WE 175

BILATERALKNEEDISLOCATIONWITHTIBIALSHAFTFRACTURE

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Bilateral Knee Dislocation with Tibial Shaft Fracture

Case Report

Rafik Elafram [α], Sabri Mahjoub [σ], Emir Bassalah [ρ], Ismail Jerbi [ω], Mohamed Abdelkefi [¥], Hedi Annabi [§], Mehdi Hadj Salah [χ] & Mondher Mbarek [ν]

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We report a case of traumatic bilateral open knee dislocation with a type 42 A2 closed right tibial shaft fracture and right common peroneal nerve palsy.

We are not aware of any other reports of such a combination of injuries.

Keywords: bilateral, knee, dislocation, tibial shaft fracture.

I. Introduction

Acute dislocation of the knee is a limb-threatening injury that often results in extensive soft-tissue damage and disruption of the popliteal blood vessels[1,2].

We reported a case of traumatic bilateral open knee dislocation with a type 42 A2 closed right tibial shaft fracture and right common peroneal nerve palsy.

We are not aware of any other reports of such a combination of injuries.

II. Case Report

In April 2013, 25-year-old male was admitted to emergency medical service by an ambulance due to a traffic accident. He was hit by a car.

After initial examination, he had severe deformity of both knees with posterior skin injury in both popliteal fossa. Also, the patient had right limb deformity.

The pulses were palpable and symmetrical in the lower limb. The patient had right common peroneal nerve palsy.

Plain radiographies of the lower extremities were performed: they showed medial right knee dislocation with ipsilateral type 42 A2 tibial shaft fracture and fracture dislocation of the left knee.

A prompt reduction was performed. The arteriogramme was made and had not shown any sign of occlusion.

In the operation room, exploration of the knees' injury revealed: in the right knee a section of the biceps femoris, broises in the common peroneal nerve and the ACL and the PCL were intact, in the left knee, no noble element was affected. The fracture was fixed with srews.

Internal fixation of the tibial and fibular shaft were performed. The patient had bilateral knee immobilization for 45 days. Then, he begun rehabilitation. The consolidation fracture was obtained after 04 months.

In the final fellow up, the range motion of the knee was0 degree to 95 degree. He had a grade-1 anterior and posterior laxity and varus instability in the right knee.

The lateral peroneal nerve palsy was recovered.

III. Discussion

Knee dislocations are uncommon, constituting less than 0.5% of joint dislocations [3]. The documented incidence of observed knee dislocations on admission per institution per year is even less and varies from 1/10,000 to 1/100,000 [4–6].

The exact mechanism responsible for the tibial shaft fracture and knee dislocation with disruption of all knee ligaments, popliteal vessels, and the common peroneal nerve was not clear [7].

In a large review by Green and Allen, 40% of 245 knee dislocations were anterior, while posterior dislocations are the second most common at 33% and are caused by direct application of a posterior force to the anterior tibia. Lateral and medial dislocations are relatively uncommon, comprising 18% (lateral) and 4% (medial) of knee dislocations [8].

A thorough neurological examination is also essential, as peroneal nerve palsies have been noted in 14–35% of knee dislocations, most commonly in posterolateral dislocations [1,6,7].

Controversies over operative versus closed immobilization of traumatic complex, multiple ligamentous knee injury are still debated. In 2004, Chin-Ho Wong et al. investigated the results of surgical and conservative treatment of knee dislocation retrospectively. The international knee documentation committee (IKDC) scores of operatively treated patients and patient satisfactions were significantly better than conservatively treated group [10].

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The most important fear in this kind of associations is to miss diagnose one dislocated joint because the other is more spectacular or threatening the limb's vitality, especially in polytrauma patients. Moreover, these associations present an evident problem of interference in management.

Two cases of combination of ipsilateral knee dislocation and tibial shaft fracture were reported in the litterature. But no bilateral open knee dislocation was noted. Therefore, we found that it would be interesting to report such an association [7,11].

IV. Conclusion

These injuries are orthopedic emergencies that have high complication rates. An awareness of the possibility of such association should lead to an appropriate treatment.

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Figure 1 : Radiography showing bilateral knee dislocation.

Figure 2 : Radiography showing tibial shaft with knee dislocation.

Figure 3 : Anterio-posterior radiography of the knees

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Figure 4 : latearl radiography of the knees

Figure 5 : Radiography of the limb.

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3. Submission of Manuscripts,

4. Manuscript's Category,

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- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

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This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

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- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

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- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
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Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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