

## Meta-Analysis

# Bioabsorbable Versus Metallic Interference Screw Fixation in Anterior Cruciate Ligament Reconstruction: A Meta-Analysis of Randomized Controlled Trials

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**Purpose:** The aim of the study was to investigate the outcomes between bioabsorbable and metallic screw fixation in anterior cruciate ligament (ACL) reconstruction. **Methods:** Randomized controlled trials (RCTs) comparing bioabsorbable versus metallic screw fixation in single-bundle ACL reconstruction were identified systematically, and the outcomes were analyzed in terms of infection rate, knee joint effusion, Lysholm score, International Knee Documentation Committee final score, pivot-shift test, and KT-1000/2000 arthrometer (MEDmetric, San Diego, CA) measurements. The type of grafts was ignored in the meta-analysis. Standard mean difference (SMD) or risk ratio (RR) with 95% confidence interval (CI) was calculated by a fixed-effects or random-effects model. Heterogeneity across the studies was also assessed. **Results:** We included 10 studies comprising 790 patients who were treated by bioabsorbable versus metallic screw fixation for single-bundle ACL reconstruction. The meta-analyzed results of these studies showed that there was no statistically significant difference between bioabsorbable and metallic screw fixation in infection rate (RR, 0.91;  $P = .87$ ; 320 patients in 5 studies), KT-1000/2000 arthrometer testing (SMD,  $-0.01$ ;  $P = .95$ ; 438 patients in 7 studies), pivot-shift testing (RR, 1.06;  $P = .82$ ; 260 patients in 4 studies), International Knee Documentation Committee final score (RR, 0.87;  $P = .63$ ; 300 patients in 5 studies), and Lysholm score (SMD, 0.03;  $P = .89$ ; 204 patients in 4 studies). The incidence of knee effusion was higher in the bioabsorbable screw group (RR, 2.57;  $P = .04$ ; 421 patients in 4 studies). **Conclusions:** There was no significant difference in measurement results of knee joint stability or knee joint function outcome between bioabsorbable and metallic interference screws. Knee joint effusion is more common after ACL reconstruction with bioabsorbable interference screw fixation than with metallic interference screw fixation. More high-methodologic quality randomized controlled trials would be helpful in further meta-analysis. **Level of Evidence:** Level I, meta-analysis.

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**A**nterior cruciate ligament (ACL) disruption is one of the most common injuries in sports medicine and sometimes requires reconstructive surgery of the liga-

ment to minimize the long-term morbidity. According to the literature, there are almost 50,000 reconstructions performed annually. As first described by Lambert,<sup>1</sup> standard surgery using autograft material has been widely accepted, with interference screws used for graft fixation. Usually, metallic or bioabsorbable interference screws are used to provide secure fixation.

Since the first use of metallic interference screws for graft fixation in 1983,<sup>1</sup> the fixation strength and long-time biocompatibility of metallic implants have been proven.<sup>2</sup> Despite the reliable results, however, metallic interference screws have some unresolved drawbacks. First, the screws could complicate surgery

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The authors report no conflict of interest.

Received April 16, 2009; accepted December 10, 2009.

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0749-8063/10/2605-9227\$36.00/0

doi:10.1016/j.arthro.2009.12.011

because of the laceration of the sutures and grafts during insertion. Moreover, the metallic screws would hinder subsequent magnetic resonance imaging (MRI) examination because of their ferromagnetic qualities and artifacts.<sup>3</sup> Difficulties also exist with the removal of screws in revision surgery.<sup>4,5</sup>

With the development of biomaterial research, the implants for graft fixation have been changing over the years. The bioabsorbable interference screws have become much more popular in ACL reconstruction with screws made of polyglycolic acid (PGA), poly-L-lactic acid (PLLA), poly-D,L-lactic acid, PGA with trimethylene carbonate, PLLA with hydroxyapatite, and PLLA with  $\beta$ -tricalcium phosphate.<sup>6</sup> The advantages of absorbable screws include that there is no need to remove the implant and subsequent MRI artifacts are minimized. In addition, absorbable interference screws decrease the likelihood of graft laceration.<sup>2</sup> Furthermore, it has been reported that there is no difference in fixation strength between absorbable and metallic screws.<sup>7</sup> However, absorbable screws still have some disadvantages in clinical practice: they are more likely to break during surgery, and the implant itself would lead to potential infection.<sup>8,9</sup> In addition, migration of absorbable interference screws into the knee joint space has been reported.<sup>10</sup>

Recently, several randomized controlled trials (RCTs) have been performed to compare the fixation of ACL graft with absorbable and metallic interference screws. These trials have overcome the limitations of observational studies by decreasing bias through randomization.

This meta-analysis reviewed the studies comparing the outcomes between bioabsorbable and metallic screw fixation in single-bundle ACL reconstruction surgery. The aim of the study was to identify and summarize the evidence from RCTs on the differences in outcomes between bioabsorbable and metallic screws, thereby testing the hypothesis that there is no difference in outcome of bioabsorbable interference screws versus metallic interference screws in single-bundle ACL reconstruction.

## METHODS

We systematically reviewed the literature and specifically searched for articles focusing on prognostic comparison between bioabsorbable and metallic screw fixation, especially for RCTs from January 1, 1966, to December 1, 2008. Two reviewers independently searched the PubMed and Cochrane databases through electronic search engines for the results.

## Eligibility Criteria

Two of the reviewers applied the eligibility criteria to the trials potentially included. Each of the eligible trials had to meet the following criteria: (1) The target population consisted of individuals who presented with ACL disruption and needed surgical intervention. (2) The intervention was defined as ligamentous reconstruction with single-bundle graft and fixation with either absorbable or metallic interference screws, regardless of graft type. (3) The study was a prospective randomized trial or pseudo-RCT. (4) The clinical outcomes were evaluated with objective measurements.

## Study Identification

We used “ACL,” “anterior cruciate ligament,” “knee joint” and “reconstruction,” and “single bundle” as text word search terms. Specifically, the search included (1) “anterior cruciate ligament” [MeSH] and “absorbable implants” [MeSH] and “bone screws” [MeSH], (2) “anterior cruciate ligament” [MeSH] and “biocompatible materials” [MeSH] and “bone screws” [MeSH], (3) “knee joint” [MeSH] and “absorbable implants” [MeSH] and “bone screws” [MeSH], and (4) “knee joint” [MeSH] and “biomaterials” [MeSH] and “bone screws” [MeSH]. All the results were limited by “randomized controlled trials” [Publication Type] and “comparative study” [Publication Type]. Studies without comparisons of the clinical results were excluded from the search result, such as case reports, technical articles, review articles, animal testing studies, or biomechanical testing studies.

We pooled the RCT studies comparing the clinical outcomes of metallic versus absorbable screws in single-bundle reconstruction of the ACL. Any study without an English-language abstract was also excluded from the results.

## Data Abstraction

Two reviewers independently extracted the information and the outcome results from each eligible trial. The data regarding basic characteristics of the enrolled studies such as the total number of the patients, the effective follow-up rate, and the mean follow-up duration were also searched and pooled. Outcomes such as the functional outcome scoring system, laxity or stability status of the involved knee, and postoperative complications were also recorded. Disagreements regarding extracted data were resolved by discussion with help from a third author.

## Methodologic Quality Assessment

Two reviewers evaluated the methodologic quality independently with a 21-point scale described by Detsky et al.<sup>11</sup> The scale evaluation included study randomization, study design, outcome assessors, and analysis method. To avoid unnecessary bias, when the publications were evaluated, the name of the journal and the names of the authors and their institutions were blinded to the investigators. In addition, any disagreement regarding methodologic quality of results was resolved by discussion with another author.

## Statistical Methods

After being extracted from the eligible trials, the results were pooled and calculated. Generally, the results consisted of continuous and categorical outcome measures. For continuous outcome measures, the standard mean difference (SMD) and the associated 95% confidence intervals (CIs) were evaluated for all studies. For categorical outcomes, risk ratio (RR) with 95% CIs was calculated. A fixed-effects model was used to evaluate the outcomes between the 2 treatment groups, whereas a random-effects model, as described by Sutton et al.,<sup>12</sup> was used when significant heterogeneity was detected.

## Heterogeneity and Publication Bias

Heterogeneity describes between-study variability, which can be related to clinical and methodologic differences between studies. In this meta-analysis heterogeneity between comparable studies was tested with the use of a standard  $\chi^2$  test as well as the  $I^2$  statistic, which describes the percentage of total variation across studies that is attributable to heterogeneity rather than chance. For the  $I^2$  statistic, a value of less than 25% is considered to reflect low heterogeneity; 50%, moderate heterogeneity; and 75%, high heterogeneity. When there was substantial heterogeneity, data of trials were pooled with the random-effects model and sensitivity subgroup analysis was performed to determine the reason for heterogeneity.

Generally, we defined study heterogeneity as a significant test of heterogeneity ( $P < .05$ ) and differences in the treatment effects across studies. We thought that the heterogeneity might be the result of different surgical techniques or the methodologic quality score. A funnel plot was created when heterogeneity was considered significant to assess for publication bias.

## RESULTS

### Study Identification

After searching the PubMed and Cochrane databases, we identified 157 publications. Among the 157 publications, 44 articles met the inclusion criteria of “randomized controlled trials.” The abstracts of these 44 articles were checked by a hand search, with the trials without clinical outcomes excluded. Accordingly, there were 10 publications left.<sup>13-22</sup> The literature search and identification process are presented in Fig 1. The assessment results for eligible trials by use of the scoring system of Detsky et al.<sup>11</sup> showed that the score ranged from 11 to 18 points. The characteristics of the studies included are listed in Tables 1 and 2. One study, by Jarvela et al.,<sup>15</sup> included cases of both single- and double-bundle reconstruction of the ACL, and only the data for single-bundle reconstruction were extracted from the original results.

### Radiologic Results

There were 7 publications<sup>13,14,16,17,19,20,22</sup> with radiologic results presented. The authors of 3 studies concluded that tunnel widening on either the femoral or tibial side was more obvious in the absorbable (PLLA) implant group than in the metallic screw group. Moisala et al.<sup>14</sup> reported that the mean diameter of the femoral tunnel in the anterior-posterior dimension was  $10.9 \pm 2.0$  mm in the bioabsorbable screw group and  $9.2 \pm 1.9$  mm in the metallic screw group at 2-year follow up. The difference between the 2 groups was significant ( $P = .01$ ). Laxdal et al.<sup>16</sup> reported that the absorbable screw group had a significantly larger mean diameter than the metallic screw group ( $6.2 \pm 2.3$  mm on the tibial side

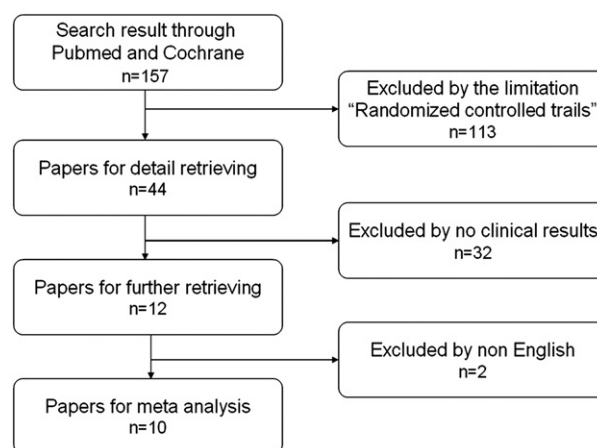


FIGURE 1. Study identification process.

**TABLE 1.** Demographic Information on Studies Included

Authors	Publication Year	No. of Patients	Mean Follow-Up Duration (mo)	Effective Follow Up (%)	Detsky Score
Moisala et al. <sup>14</sup>	2008	62	24	89	14/21
Myers et al. <sup>13</sup>	2008	117	24	87.7	18/21
Jarvela et al. <sup>15</sup>	2008	52	24	78.8	14/21
Laxdal et al. <sup>16</sup>	2006	77	24	88.3	14/21
Kaeding et al. <sup>17</sup>	2005	97	12	100	14/21
Drogset et al. <sup>18</sup>	2005	41	24	90.2	12/21
Fink et al. <sup>19</sup>	2000	40	24	92.5	12/21
Benedetto et al. <sup>20</sup>	2000	124	12	91.2	11/21
McGuire et al. <sup>21</sup>	1999	204	28.8	80.4	12/21
Barber et al. <sup>22</sup>	1995	110	12	77.3	14/21

and  $6.3 \pm 3.0$  mm on the femoral side v  $3.0 \pm 2.2$  mm on the tibial side and  $1.9 \pm 2.2$  on the femoral side,  $P < .0001$ ). In the study of Myers et al.,<sup>13</sup> a wider middle femoral tunnel was shown in the bioabsorbable screw group when both anterior-posterior ( $P = .05$ ) and medial-lateral ( $P = .003$ ) dimensions of the tunnels were measured, but the distal tunnel sizes were not different between the groups. In the remaining 4 publications, tunnel widening was also mentioned with no data given in detail. However, the data from these trials could not be simply synthesized for further meta-analysis because the extracted data were limited and the implant sizes and evaluation methods varied among the trials.

### Functional Outcome

Among all the RCT studies included, 4 articles provided the results of the Lysholm score with standard differences. With a random-effects model, the results showed that there was no significant difference between the 2 groups in Lysholm functional score

(SMD, 0.03 [95% CI,  $-0.39$  to  $0.45$ ];  $P = .89$ ) (Fig 2). The forest plot showed better Lysholm scores with metallic screw fixation than with absorbable screw fixation, but the difference was not statistically significant. Heterogeneity across the studies was considered nonsignificant ( $P = .09$ ,  $I^2 = 54\%$ ).

The information regarding the International Knee Documentation Committee (IKDC) final score was also extracted from 5 studies. No significant difference was found between the 2 groups with a fixed-effects model (RR, 0.87 [95% CI, 0.51 to 1.51];  $P = .63$ ) (Fig 3). There was no significant heterogeneity across the studies included ( $P = .46$ ,  $I^2 = 0\%$ ).

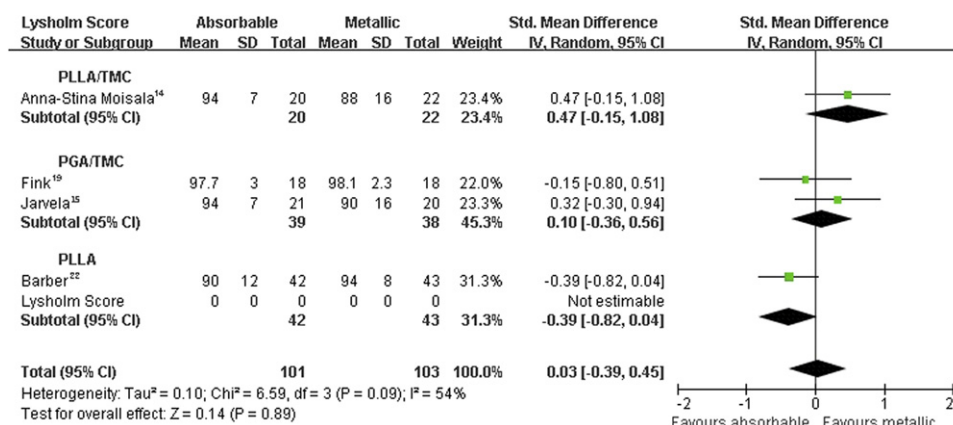
### Stability of Knee Joint

In 7 studies KT-1000/-2000 arthrometer (MEDmetric, San Diego, CA) (side to side, not manual) results were reported in a total of 438 cases. The results from a fixed-effects model analysis showed no advantage in either group (SMD,  $-0.01$  [95% CI,  $-0.20$  to  $0.18$ ];

**TABLE 2.** Surgical Protocol and Timing of Rehabilitation in Studies Included

Authors	Type of Metallic Screw	Type of Bioabsorbable Screw	Graft Material	Timing of Rehabilitation
Moisala et al. <sup>14</sup>	Unclear	PLLA/TMC	Quadrupled hamstring tendons autograft	Immediately after surgery
Myers et al. <sup>13</sup>	Titanium	HA-PLLA	Hamstring tendon autograft	Not mentioned
Jarvela et al. <sup>15</sup>	Unclear	PGA/TMC	Hamstring tendon autograft	Immediately after surgery
Laxdal et al. <sup>16</sup>	Titanium	PLLA	Hamstring tendon autograft	Immediately after surgery
Kaeding et al. <sup>17</sup>	Titanium	PLLA	BPTB autograft	Unclear
Drogset et al. <sup>18</sup>	Unclear	PLLA	BPTB autograft	Immediately after surgery
Fink et al. <sup>19</sup>	Titanium	PGA/TMC	BPTB autograft	Immediately after surgery
Benedetto et al. <sup>20</sup>	Titanium	PGA/TMC	BPTB autograft	2 wk after surgery
McGuire et al. <sup>21</sup>	Unclear	PLLA	BPTB autograft, BPTB allograft, Achilles tendon allograft, combination of autologous and allogeneic grafts	Immediately after surgery
Barber et al. <sup>22</sup>	Unclear	PLLA	BPTB autograft	Immediately after surgery

Abbreviations: TMC, trimethylene carbonate; HA, hydroxyapatite; BPTB, bone–patellar tendon–bone.



**FIGURE 2.** Studies reporting Lysholm score assessment. The forest plot shows the number of individuals and mean Lysholm score with standard differences (SD). The point estimates are accompanied by a line that shows the 95% CI. SMDs were used and pooled to describe the difference between the 2 groups. A random-effects model was used to calculate the results. The diamond graph crossed the zero line, which suggested that there was no statistical difference between the 2 groups. (TMC, trimethylene carbonate.)

$P = .91$ ) (Fig 4). Heterogeneity was not significant ( $P = .95$ ,  $I^2 = 0\%$ ).

The pivot-shift test was also measured in 4 studies. With a fixed-effects model, the results showed no difference in positive pivot-shift tests between the 2 groups (RR, 1.06 [95% CI, 0.67 to 1.67];  $P = .82$ ) (Fig 5). Heterogeneity was not significant across the studies ( $P = .20$ ,  $I^2 = 35\%$ ).

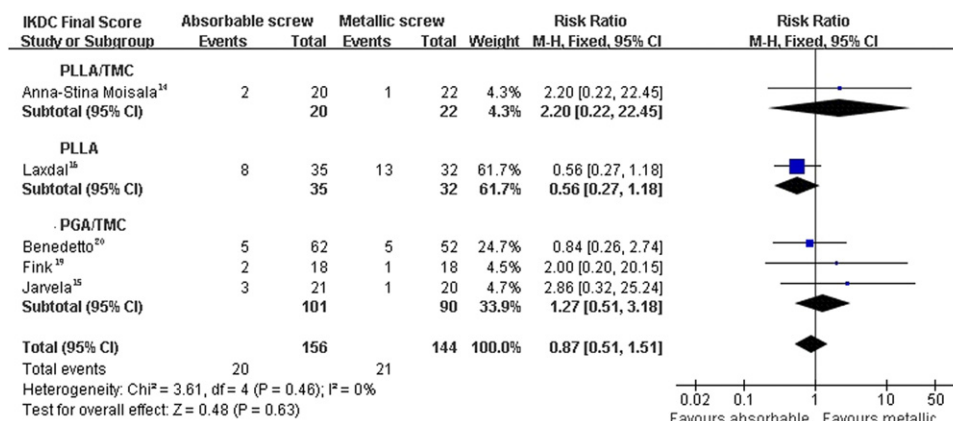
## Complications

Deep infection was reported in 5 studies. The results analyzed with a fixed-effects model suggested no difference in infection occurrence between the metallic and bioabsorbable interference screw groups (RR, 0.96 [95% CI, 0.30 to 3.13];  $P = .95$ ) (Fig 6). Heterogeneity was not significant across the studies ( $P = .76$ ,  $I^2 = 0\%$ ). Prolonged effusion of the knee joint was also recorded in 4 publications. Knee joint effu-

sion in the bioabsorbable interference screw group was more common than that in the metallic interference screw group, and the difference was statistically significant (RR, 2.57 [95% CI, 1.03 to 6.43];  $P = .04$ ) (Fig 7). Other complications such as breakage of the absorbable implants and migration of the metallic implants were also reported in some studies.<sup>22</sup>

## Rehabilitation

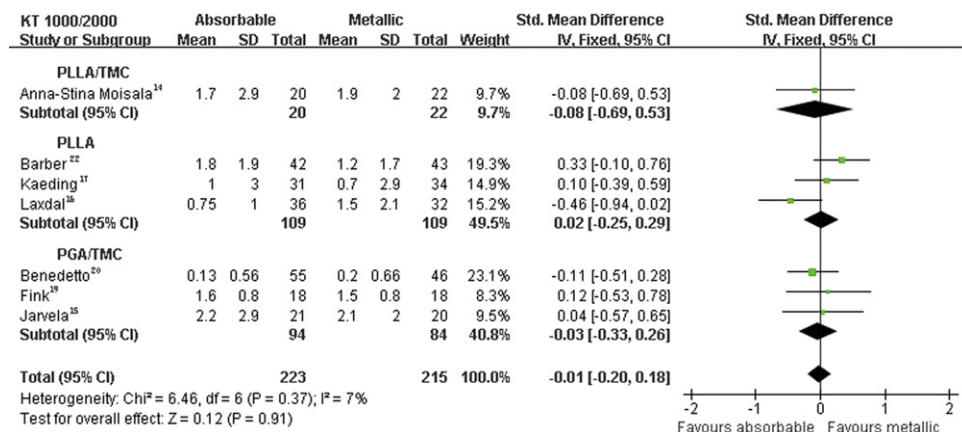
In most of the eligible trials, the timing of rehabilitation was mentioned. Intermediate full weight bearing after surgery as tolerated was mentioned in 4 studies, with or without full range of motion of the knee. Fink et al.<sup>19</sup> reported that full weight bearing began within 2 days after surgery, whereas 2 studies mentioned progressive weight bearing as tolerated after surgery.<sup>18,21</sup> The remaining articles did not describe the rehabilitation protocol in detail.<sup>13,17</sup>



**FIGURE 3.** Studies reporting valid IKDC final scores. The forest plot shows the number of individuals with abnormal IKDC final scores. The RR was used to describe the difference between the 2 groups with the 95% CI. A fixed-effects model was used to evaluate the results. The results showed that use of metallic fixation resulted in a greater chance of having an abnormal IKDC final score, although the difference was not obvious. (TMC, trimethylene carbonate.)



**FIGURE 4.** Studies reporting KT-1000/2000 arthrometer measurements. The forest plot shows the means of KT-1000/2000 arthrometer results with SD. SMDs with 95% CIs calculated by a fixed-effects model were used to show the difference between the 2 groups, and the result showed no statistical difference. (TMC, trimethylene carbonate.)



## DISCUSSION

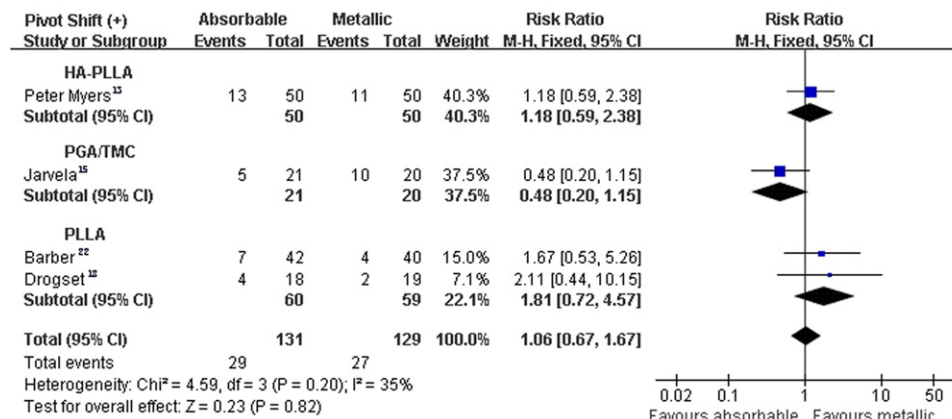
### Analysis of Outcome

This study compared the clinical outcome between bioabsorbable and metallic interference screw fixation in single-bundle ACL reconstruction surgery. The results from 10 eligible RCTs were pooled and calculated by a meta-analysis method. On the basis of the results of meta-analysis, we found that there was no difference in the treatment outcome between the 2 interference screw fixation groups, as evaluated by IKDC final score, Lysholm score, and KT arthrometer measurement, therefore suggesting that bioabsorbable screw fixation can be an effective alternative to standard metallic screw fixation in ACL reconstruction with similar clinical outcomes achieved.

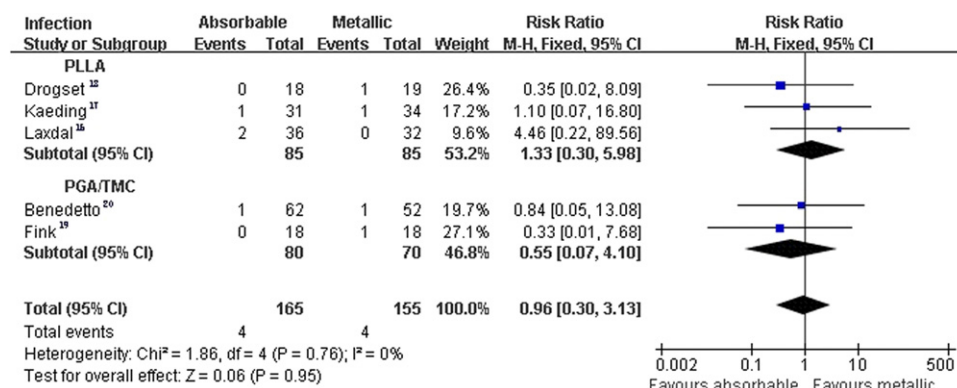
IKDC final score and Lysholm score were used in this study to evaluate the functional outcome after ACL reconstruction surgery. The results suggested that the chance of obtaining a normal functional knee was equal in both interference screw groups. No dif-

ference in Lysholm score was detected between the 2 implants. Overall, the pooled data suggested that there is no obvious advantage of one type of screw over the other with regard to the clinical functional outcome. Thus the functional outcome of using absorbable interference screws was satisfactory, when compared with the traditional gold standard of metallic screw fixation. Nevertheless, because the IKDC final score and Lysholm score are not sensitive to changes over time,<sup>23</sup> further studies are needed to determine the long-term outcome with more sensitive outcome measures.

The data from KT arthrometer and pivot-shift testing were analyzed to evaluate the stability of the knee joint after reconstruction surgery in this meta-analysis. The results showed that the difference on the surgical side was not statistically significant when KT arthrometer or pivot-shift testing results were compared between the bioabsorbable and metallic interference screw groups. Because the KT-1000/2000 arthrometer is used to define the laxity of the knee joint in the



**FIGURE 5.** Studies reporting pivot-shift test results. The forest plot shows the numbers of positive pivot-shift test results. The RR with 95% CI was used to describe differences between the 2 groups. A fixed-effects model was used to analyze the results. The results showed that metallic screw fixation had a lower chance of resulting in a positive pivot-shift test result. However, the difference between the 2 interference screws was not significant. (HA, hydroxyapatite; TMC, trimethylene carbonate.)



**FIGURE 6.** Six studies reported the infection rate between the different interference screws. The forest plot of infection rate included a total of 320 patients and was analyzed with a fixed-effects model. The RR with 95% CI showed that the difference in infection rate was not significant between the 2 groups.

anteroposterior plane and the pivot-shift test refers to anterolateral stability of the knee joint, this finding would indicate that the stability of the reconstructed knee joint was not influenced by the type of interference screw fixation.

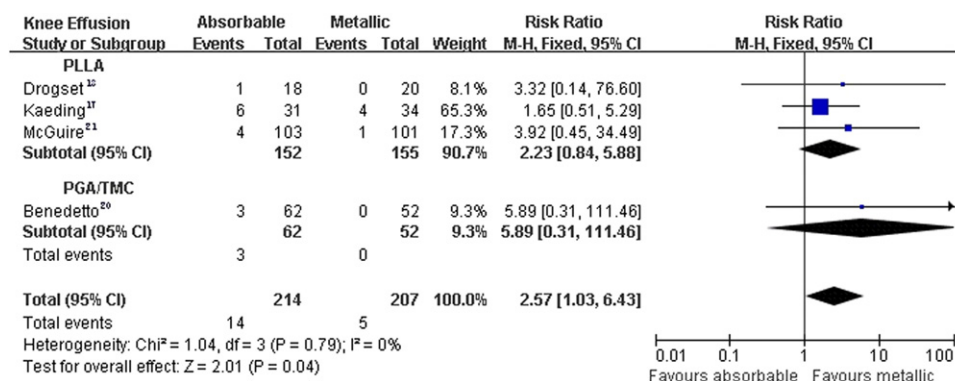
The results of this study were also in accordance with the results of an in vitro biomechanical study reported previously. In that study Kousa et al.<sup>7</sup> noted that the initial fixation strength of bioabsorbable interference screws was not significantly different from that of metallic screws under cyclic loading and suggested that bioabsorbable interference screws could provide sufficient fixation strength. Our meta-analysis pooled 1- or 2-year clinical outcomes and showed that the difference in knee joint stability after reconstruction is not significant between absorbable and metallic screws, as proved by the results of the pivot-shift test and arthrometer examination. Loosening and migration of the absorbable screws were reported.<sup>10,24,25</sup> Among all the studies included, however, few patients had such complications. Therefore it may be concluded that absorbable screws could provide reliable

fixation strength of the graft, as compared with standard metallic screws.

The possibility of potential infection with absorbable screw fixation was mentioned by some authors.<sup>8,26</sup> They believed that the infection might change the local pH environment and accelerate the degeneration of the absorbable implants,<sup>8</sup> thus leading to migration of the implants. Nevertheless, in the RCTs included in our study, the pooled data showed no difference in infection rate between the bioabsorbable and metallic screw fixation groups.

In our study significant bone tunnel widening was found in the PLLA implant group with autografts.<sup>13,14,16</sup> These results indicated that PLLA implants might cause more local osteolysis at the surgical site than metallic implants when the timing and protocol of rehabilitation are similar in both groups. Tunnel widening has been associated with laxity of the knee. However, all of these authors concluded there was no relation between this phenomenon and the functional outcome during the short-term

**FIGURE 7.** Four studies reporting knee joint effusion after ACL reconstruction. There were a total of 421 patients included in the meta-analysis. The RR with 95% CI was used to describe the difference between the 2 groups. A fixed-effects model was used to analyze the results. The results showed that metallic screw fixation had a lower chance of resulting in knee joint effusion after ACL reconstruction. The difference between the 2 interference screws was significant.



follow up because the functional outcome was not different between the groups.

Adverse tissue response to absorbable implants such as effusion and pretibial cyst formation has been reported after ACL reconstruction surgery.<sup>26,27</sup> In the publications included, only that of Benedetto et al.<sup>20</sup> reported a case (PGA/trimethylene carbonate screw fixation with autograft) with cyst formation on the tibial side; the cyst disappeared without any intervention. They suggested that transmission of synovial fluid, graft necrosis, and accumulation of absorbable degenerative product might be the potential mechanisms. In addition, prolonged effusion in the knee joint is another common complication after ACL reconstruction surgery with bioabsorbable screw fixation.<sup>28</sup> The results of this meta-analysis showed that knee joint effusion in the bioabsorbable interference screw group was more common than in the metallic interference screw group. Although no studies focusing on the relation between prolonged knee effusion and functional outcome were found in our study, further investigation into the outcome of such patients is necessary.

Recently, the advantages of bioabsorbable interference screws have been well recognized by orthopaedic surgeons, with PLLA or PGA implants being widely applied in clinical practice. Publications have also reported satisfactory short-term outcomes of bioabsorbable implants. The duration of their degradation period is sufficiently long to provide the security of graft fixation before host bone ingrowth occurs. However, a prolonged degradation period may potentially cause adverse reactions. Future research regarding the ideal bioabsorbable materials should focus on improvements in stiffness and strength, as well as degradation characteristics of implants, while ideal biocompatibility is secured.

### Future Study Perspective

Future studies of this issue, we believe, should focus on the high methodologic quality of RCTs. All of the patients should be treated with a standard technique and evaluated by objective, standard measurements, and the outcome assessments should be blinded. The radiologic results such as the diameter of the tunnels and the time to complete absorption of the bioabsorbable implants should also be recorded in detail, ideally based on MRI findings. In addition, measurements of quality of life and patient satisfaction should also be considered during follow-up assessment.

### Strengths and Limitations

To our knowledge, this study is the first meta-analysis to compare the outcomes between these 2 different interference screws. To obtain reliable results, our review focused on RCTs. In all the studies we used for meta-analysis, the results with objective measurements as well as the quality of these studies were evaluated.

Despite our efforts, drawbacks still exist in this study. First, some studies had limitations of methodologic quality, and some did not provide a clear description of details regarding follow-up data and outcome measurement results. Although these studies were less weighted for analysis and the disagreements were minimized by discussion, bias could not be prevented fully. Second, in all studies we pooled together, the results were linked with different techniques, different implants, and different grafts. For instance, Freedman et al.<sup>29</sup> concluded that ACL reconstruction with patellar tendon autograft would lead to greater knee stability than reconstruction with hamstring tendon autograft based on the results of meta-analysis. These factors will limit the findings of the study. The follow-up periods were also different among studies, which would add bias and complexity to the analysis. Third, in all of the studies, the follow-up examinations were not blinded. Thus the strength of the results and conclusions might be weakened.

### CONCLUSIONS

This meta-analysis showed that there was no significant difference in measurement results of knee joint stability and knee joint function outcome between bioabsorbable and metallic interference screws. Knee joint effusion is more common after ACL reconstruction with bioabsorbable interference screw fixation than with metallic interference screw fixation.

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