The characteristics and costs of traumatic extremity amputation versus replantation at a single center in the Republic of Korea: a retrospective observational study

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Purpose: This study investigated the epidemiology and treatment outcomes of patients with traumatic limb amputation who visited a regional trauma center.

Methods: From November 2015 to December 2021, patients with traumatic limb amputation who visited the Regional Trauma Center at Pusan University Hospital were retrospectively studied. The injury mechanism, number of operations for accompanying injuries, hospitalization period, injury severity score, insurance classification, and medical costs were investigated using medical records. We analyzed medical costs according to the injury site and treatment method.

Results: We enrolled 57 patients who visited the hospital for traumatic limb amputation. The median patient age was 55 years, and there were 48 males and nine females. Seventeen patients underwent replantation, and 40 patients underwent amputation. Replantations were performed in 43.7% of cases of upper extremity injuries and in 12.0% of cases of lower extremity injuries. Six operations were performed per patient for replantation and three for amputation (p=0.027). In an analysis of the total medical costs submitted to the national health insurance system, replantation surgery was over twice as expensive as amputation surgery for the upper extremities (p=0.029). However, no significant cost difference was observed for lower limb amputations.

Conclusion: As a treatment for limb amputation patients, replantation requires a higher number of operations and a longer hospital stay than amputation. There was no difference in patients’ contributions to medical costs between replantation and amputation, but from the standpoint of national health insurance coverage, upper extremity injuries cost more when treated by replantation than by amputation.

Keywords: Traumatic amputation, Replantation, Surgical amputation, Health care costs

Introduction

The first upper limb replantation in a 12-year-old pediatric patient was reported by Malt and Mckhann [1] in 1962, and the first successful replantation surgery for
lower limb amputation was achieved in Korea in 1976 [2]. Since then, replantation surgery for traumatic amputation has been actively performed in Korea [3-7]. In clinical practice, this surgery should be performed within a so-called "golden time" for successful limb reattachment. However, it remains challenging to meet time deadlines, as patients at major trauma centers often present with severe injuries to the head, chest, and abdomen [8-10]. Furthermore, if the trauma is life-threatening, all situations must be excluded and revision amputation must be expedited.

Generally, revision amputation requires less time than replantation and can reduce hospitalization time, but the resulting patient cosmetic satisfaction is very low. Replantation surgery is more difficult to perform, but good success rates are currently being reported with the development of microsurgery [11]. Successful replantation can provide very high satisfaction to patients in terms of functional and cosmetic results, although the length of hospitalization and hospitalization costs are relatively high compared to revision amputation [12].

To our knowledge, there are no reports regarding patient characteristics and medical costs in the domestic environment for patients treated for traumatic amputation from a single center in the Republic of Korea. Such data are crucial for making surgical decisions and comparing outcomes, but obtaining it remains challenging due to the scarcity of cases. Therefore, in this study, we analyze and report medical costs based on the epidemiology and treatment methods of patients with traumatic limb amputations who visited a level 1 trauma center in Korea.

Methods

Ethics statement: This study was approved by the Institutional Review Board of the Medical Research Institute at Pusan National University Hospital (No. 2403-012-137). The study was performed in accordance with the Declaration of Helsinki, and written informed consent was obtained from all participants for research studies and presented data.

From November 2015 to December 2021, we conducted a retrospective investigation among 57 patients, excluding 11 patients who were transferred to the regional trauma center of Pusan National University Hospital due to traumatic limb amputation or incomplete amputation, and two patients who died in the emergency room. Exclusion criteria were pediatric patients under 18 years of age and soft tissue amputations such as fingertip amputations. Cases in which amputation was performed due to failure after reattachment were also excluded.

The causes of injury were four rope injuries (7.0%), 10 machine injuries (17.5%), 21 traffic accidents (36.8%), 16 roller machine injuries (25.4%), four expulsions (7.0%), and four others (7.0%) (Table 1). For the treatment of limb amputation, revision amputation or replantation was selected depending on the presence of the amputated limb (stump), degree of contamination, ischemic time, and the pattern of accompanying fractures. Vascular damage was diagnosed using physical examination, angiography, and three-dimensional computed tomography. All patients underwent replantation or stump revision under general anesthesia.

Before surgical replantation, debridement should be performed on the amputated proximal part and the amputated limb and contaminating subjects or foreign bodies fully removed within the shortest time possible. First, fixation was performed using a plate or external fixation device, and depending on the case, bone shortening of an appropriate length was performed. Subsequently, vascular anastomosis and in some cases, a vein graft, was performed. The tendon and nerve were repaired. If possible, neurorrhaphy was performed without a graft. Areas with severe nerve defects were tagged for future nerve grafting. If the wound defect of the severed part was large, negative pressure wound therapy was applied. Later, the soft tissue was reconstructed through skin grafting or flap surgery.

Postoperative management for patients who underwent replantation included assessing blood flow status by observing capillary refill, color, and temperature of the reattached part over an average of 5 to 7 days. Drug treatment for blood circulation improvement (Eglandin 10 mg every day, for 7 days; Mitsubishi Tanabe Pharma, Osaka, Japan) was administered. The severed part was kept at a constant temperature using a Bair Hugger system for 50 minutes with a 10-minute rest.

We investigated injury mechanisms, accompanying injuries, number of surgeries, length of hospital stay, injury severity score (ISS), insurance classification, medical costs, and the financial burden on the guarantor by reviewing each patient’s medical records (Table 1). We analyzed medical costs based on treatment methods. Each patient’s insurance was categorized as national health insurance, car insurance, worker’s compensation insurance, type 1 Medicaid, or uninsured. We analyzed each patient’s financial burden and total cost, which includes insurance financial contribution, separately.

We divided patients into the replantation and amputation groups for analysis. Continuous variables were compared between groups with the Mann-Whitney U-test for nonnormally distributed data and the Fisher exact test for categorical variables. A two-sided p-value of less than 0.05 was considered to
Table 1. Patient characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Replantation</th>
<th>Revision amputation</th>
<th>P-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>17</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Sex, male:female</td>
<td>15:2</td>
<td>33:7</td>
<td>0.710</td>
</tr>
<tr>
<td>Age (yr), mean</td>
<td>52.9</td>
<td>56.1</td>
<td></td>
</tr>
<tr>
<td>Age (yr), median</td>
<td>56 (48–64)</td>
<td>57 (52–64)</td>
<td>0.594</td>
</tr>
<tr>
<td>Injury mechanism</td>
<td></td>
<td></td>
<td>0.109</td>
</tr>
<tr>
<td>Rope injury</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Machinery injury</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Traffic accident</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Roller machinery injury</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Expulsion</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Injury pattern</td>
<td></td>
<td></td>
<td>0.004*</td>
</tr>
<tr>
<td>Crush</td>
<td>9</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Sharp cut</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Avulsion</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Amputated</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>ISS, mean</td>
<td>16.8</td>
<td>16.2</td>
<td>0.687</td>
</tr>
<tr>
<td>ISS, median</td>
<td>16 (9–22)</td>
<td>14 (9–24)</td>
<td></td>
</tr>
<tr>
<td>Involved site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper:lower</td>
<td>14:3</td>
<td>18:22</td>
<td>0.009*</td>
</tr>
<tr>
<td>No. of operations, mean</td>
<td>6.1</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>No. of operations, median</td>
<td>5 (4–7)</td>
<td>2 (2–4)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Hospitalization period (day), mean</td>
<td>73.5</td>
<td>68.8</td>
<td></td>
</tr>
<tr>
<td>Hospitalization period (day), median</td>
<td>80 (50–98)</td>
<td>46 (21–76)</td>
<td>0.078</td>
</tr>
<tr>
<td>ICU admission period (day), mean</td>
<td>5.3</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>ICU admission period (day), median</td>
<td>2 (0–4)</td>
<td>2 (0–7)</td>
<td>0.928</td>
</tr>
</tbody>
</table>

Values are presented as number only, mean only, or median (interquartile range). ISS, injury severity score; ICU, intensive care unit.

*Analyzed by the Mann-Whitney U-test or Pearson chi-square test.

*p < 0.05, statistically significant.

Results

Among a total of 57 patients who visited the hospital for limb amputations, the median age was 55 years (range, 25–71 years), with 48 males (84.2%) and nine females (15.7%). Among them, 17 underwent replantation surgery and 40 underwent surgical stump revision surgery after amputation. The mechanisms of injury, accompanying injuries, ISS, frequency of operation, and hospitalizations were compared between groups and are summarized in Table 1.

The median ISS was 16 (interquartile range [IQR], 9–22) with no significant difference between groups. The median ISS of upper extremity injuries was 12 (15 in the replantation group and 10 in the amputation group), with no significant difference between groups (p = 0.568). The median ISS of lower extremity injuries was 14 (22 in the replantation group and 14 in the amputation group). Injury severity was higher in the replantation group, but the difference was not significant (p = 0.238). The average time of arrival at the emergency room was 80 minutes after injury (IQR, 50–170 minutes). There was no difference in the treatment method according to the injury mechanism, but the frequency of traffic accidents was higher in the amputation group (28.0% vs. 8.7%, p = 0.046). The types of injuries included crushing injuries, sharp cuts, and avulsion, with the frequency of crushing injuries higher in the group with revision amputation (54.3% vs. 15.7%, p = 0.009), while the frequency of avulsion injuries was higher in the replantation surgery group (7.0% vs. 0%, p = 0.001). The ratio of upper and lower extremity injuries
was 32 upper extremity (56.1%) to 25 lower extremity (43.9%), and of these, replantation surgery was performed in 17 of the 32 upper extremity (53.1%) and 3 of the 25 lower extremity cases (12.0%), with a higher ratio performed on the upper extremity (p = 0.002).

A detailed analysis of 32 upper extremity amputees revealed that 14 underwent replantation surgery, while 18 underwent revision amputation. The replantation group underwent the median of five surgeries (IQR, 4–6), significantly more than the amputation group, which underwent the median of two surgeries (IQR, 2–3) (p = 0.006). The replantation group also had a significantly longer median hospital stay (58 days; IQR, 25–95 days) compared to the revision amputation group (30 days; IQR, 15–48 days) (p = 0.03).

Of the 25 patients with lower extremity injuries, 22 (88.0%) underwent revision amputation procedures, while only three patients (8%) underwent replantation surgery. The median of surgeries was nine (IQR, 4–20) in the replantation group and three (IQR, 2–4) in the revision amputation group (p = 0.027). The median hospitalization period was 98 days (IQR, 83–120 days) for replantation and 51 days (IQR, 39–94 days) for revision amputation, but the difference was not statistically significant (Table 2).

The patients’ medical cost burden was shared by national health insurance (29 patients, 58.8%), workers compensation insurance (15 patients, 26.3%), car insurance (nine patients, 15.7%), type 1 Medicaid (two patients, 3.5%), and uninsured (one patient, 1.8%). The total medical cost (the sum of the patient’s share and the insurance share) was higher for replantation surgery at 38.97 million Korean won (KRW) (IQR, 28,507,275–76,366,021 KRW) than for revision amputation surgery at 24.75 million KRW (IQR, 6,030,381–50,894,746 KRW) for upper extremities but the difference was not significant (p = 0.129). Among lower extremity injuries, the difference between 48.11 million KRW (IQR, 46,729,058–92,029,756 KRW) for replantation and 26.50 million KRW (IQR, 21,568,516–62,540,122 KRW)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Replantation</th>
<th>Amputation</th>
<th>P-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper limb amputations</td>
<td>32</td>
<td>14</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Injury level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0.631</td>
</tr>
<tr>
<td>Elbow joint</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.438</td>
</tr>
<tr>
<td>Forearm</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>0.008*</td>
</tr>
<tr>
<td>Wrist</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>&gt; 0.999</td>
</tr>
<tr>
<td>Hand</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0.492</td>
</tr>
<tr>
<td>Finger</td>
<td>13</td>
<td>2</td>
<td>11</td>
<td>0.012*</td>
</tr>
<tr>
<td>ISS</td>
<td>12 (5–22)</td>
<td>15 (9–19)</td>
<td>10 (4–27)</td>
<td>0.568</td>
</tr>
<tr>
<td>No. of operations</td>
<td>3 (2–5)</td>
<td>5 (4–6)</td>
<td>2 (2–3)</td>
<td>0.012*</td>
</tr>
<tr>
<td>Hospitalization period (day)</td>
<td>46 (19–85)</td>
<td>58 (25–95)</td>
<td>30 (15–48)</td>
<td>0.037*</td>
</tr>
<tr>
<td>ICU admission period (day)</td>
<td>0 (0–4)</td>
<td>1 (0–4)</td>
<td>0 (0–5)</td>
<td>0.550</td>
</tr>
<tr>
<td>Lower limb amputations</td>
<td>25</td>
<td>3</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Injury level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above knee</td>
<td>9 (36.0)</td>
<td>1 (33.3)</td>
<td>8 (36.4)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Below knee</td>
<td>16 (64.0)</td>
<td>2 (66.7)</td>
<td>14 (63.6)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Ankle</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Foot</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Toe</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>ISS</td>
<td>14 (10–22)</td>
<td>22 (16–27)</td>
<td>14 (9–22)</td>
<td>0.238</td>
</tr>
<tr>
<td>No. of operations</td>
<td>3 (2–4)</td>
<td>9 (4–20)</td>
<td>3 (2–4)</td>
<td>0.027*</td>
</tr>
<tr>
<td>Hospitalization period (day)</td>
<td>67 (42–98)</td>
<td>98 (83–120)</td>
<td>51 (39–94)</td>
<td>0.132</td>
</tr>
<tr>
<td>ICU admission period (day)</td>
<td>3 (2–15)</td>
<td>14 (4–15)</td>
<td>3 (1–13)</td>
<td>0.218</td>
</tr>
</tbody>
</table>

Values are presented as number only, median (interquartile range), or number (%).

ISS, injury severity score; ICU, intensive care unit.

<sup>a</sup>Analyzed by the Mann-Whitney U-test or Fisher exact test.

*p<0.05, statistically significant.
for revision amputation was also not significant ($p=0.242$). However, the total medical costs of 32 upper extremity injuries covered by national health insurance were 40.05 million KRW (IQR, 28,507,275–76,366,021 KRW) for replantation surgery, and 19.82 million KRW (IQR, 5,457,026–31,586,099 KRW) for revision amputation surgery, a significant difference ($p=0.029$). There were no differences for other types of insurance in upper extremity injuries.

The actual patient share of costs for upper limb injuries was 4.39 million KRW (IQR, 1,603,930–9,745,988 KRW), and among these, the actual patient share for replantation surgery was higher at 4.96 million KRW (IQR, 2,371,020–10,423,497 KRW) than the 3.56 million KRW (IQR, 1,119,672–8,435,901 KRW) of the revision amputation group but the difference was not significant ($p=0.342$). In terms of the form of medical expense burden, for using health insurance, the replantation surgery cost was 10.42 million KRW (IQR, 7,573,237–13,283,499 KRW), and the revision amputation cost was 4.54 million KRW (IQR, 1,309,028–9,858,507 KRW) but the difference was not significant ($p=0.104$). There was no difference between treatment methods for car insurance, industrial accident insurance, the uninsured, and medical benefits type 1.

In an analysis of 25 lower limb injuries, we observed no cost differences. The total medical costs and patients' actual co-payments for both upper and lower extremity amputations are detailed separately in Table 3.

**Discussion**

In this study, most traumatic amputation patients were young adults, and overwhelmingly male, potentially due to injuries associated with labor using machinery or traffic accidents. The proportion of traffic accident patients was especially high, even among patients who underwent amputation surgery immediately after traumatic amputation. The average time to arrive at the emergency room was 65 minutes after injury for replantation surgery and 80 minutes for revision amputation surgery, but the difference was not significant. The ISS was an median of 14 points, with no significant difference between the two groups in this study.

In comparisons between upper limb amputees who underwent prosthetic fitting after revision amputation and those who underwent replantation surgery, most of the replantation group were satisfied with the results. The satisfaction rate of patients who underwent prosthetic fitting after amputation above the elbow was significantly lower at 30%, while about 50% who underwent amputation below the elbow were satisfied [13], proba-

**Table 3. Characteristics and medical costs of traumatic upper limb amputation**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Amputation (n=18)</th>
<th>Cost (KRW)</th>
<th>P-value</th>
<th>Replantation (n=14)</th>
<th>Cost (KRW)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>32</td>
<td>4,394,112 (1,603,930–9,745,988)</td>
<td>0.342</td>
<td>4,960,602 (2,371,020–10,423,497)</td>
<td>0.342</td>
<td></td>
</tr>
<tr>
<td>Medical costs (patient's contribution)</td>
<td>18</td>
<td>3,561,463 (1,119,672–8,435,901)</td>
<td>0.029*</td>
<td>3,897,633 (1,089,890–4,732,430)</td>
<td>0.129</td>
<td></td>
</tr>
<tr>
<td>National Health Insurance</td>
<td>20</td>
<td>8,004,569 (2,372,984–12,025,493)</td>
<td>0.104</td>
<td>10,423,497 (7,573,237–13,283,499)</td>
<td>0.104</td>
<td></td>
</tr>
<tr>
<td>Car Insurance</td>
<td>2</td>
<td>3,382,267 (224,900–6,539,633)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker's Compensation Insurance</td>
<td>9</td>
<td>2,232,248 (1,094,880–2,774,891)</td>
<td>0.242</td>
<td>2,371,020 (1,094,880–4,732,430)</td>
<td>0.242</td>
<td></td>
</tr>
<tr>
<td>Private payment (uninsured)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I medical benefits</td>
<td>1</td>
<td>424,085</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost (sum)</td>
<td></td>
<td>257,232,451</td>
<td></td>
<td>101,852,302</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values are presented as number only or median (interquartile range). KRW, Korean won.

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Arch Hand Microsurg [Epub ahead of print]

https://doi.org/10.12790/ahm.24.0020
bly because prosthesis function was better below the elbow [10].
When considering replantation surgery, it is necessary to con-
sider the surgical risks, costs, treatment time, and complications.
While it has been reported that replantation surgery can be con-
sidered if the degree of contamination is low and the time
elapsed after injury is short, it is better to wear a prosthesis after
amputation if those conditions do not apply [11]. Compared to
revision amputation, limb replantation requires more surgeries,
longer hospital stays, and a longer rehabilitation process, and al-
though it is psychologically and economically painful, there are
reports that the quality of life is the same with revision ampu-
tation [14]. Therefore, a balance between patient satisfaction and
cost-effectiveness needs to be considered when deciding on the
surgical method.

In this study, the mean hospital stay was longer for replanta-
tion surgery patients at 73.5 days, compared to 68.8 days for
amputation surgery. The mean number of surgeries was also
higher for replantation surgery at 6.1, compared to 3.1 for revi-
sion amputation surgery. Ultimately, differences in the number
of surgeries and length of hospital stay are reflected in medical
costs. Zhu et al. [15] reported that in a comparison of medical
costs among traumatic amputation patients in China, replanta-
tion surgery cost about six times more (p < 0.001) and required
a longer hospital stay than amputation surgery. However, ac-
cording to a cost-effectiveness study of traumatic amputees in
the United States by Yoon et al. [16], replantation surgery was
more expensive than revision amputation surgery, but if the ad-
ditional medical costs that patients can bear in the United States
environment are less than 100,000 US dollars, replantation sur-
gery is more cost-effective than revision amputation surgery. In
recently published studies of cost-effectiveness related to finger
amputation injuries, replantation treatment had greater costs
compared to revision amputation [17-19]. The cost-effectiveness
of surgery can vary depending on the medical environment of
each country, so it is difficult to compare based on cost.

There are several unique considerations in Korean clinics.
First, patients generally face a low financial burden due to the
existence of various medical payment forms such as health in-
surance, car insurance, industrial accident benefits, and benefits
for foreign nationals. Specifically for upper limb injuries, pa-
tients with car insurance and industrial accident insurance bear
significantly lower costs, between 1/50 and 1/5 of those borne
by those covered solely by health insurance. If osteoplasty is per-
formed, the difference ranges from 1/25 to 1/1.4 times. Second,
due to Korean culture, there is a preference to attempt replot-
tion first, even if the chance of success is relatively low. In this
study, out of 19 cases where replantation was performed on the
upper extremities, seven cases failed and required revision am-
putation. This high failure rate suggests that cultural factors are
significant. Although several studies suggest that a higher ISS
implies a higher probability of amputation [20,21], in this study
we found no significant difference, which could be explained by
cultural aspects.

Unlike finger amputation, limb amputation has very signifi-
cant functional and aesthetic issues, and often has direct impacts
on the patient’s life, so it is difficult to consider cost-effectiveness
when deciding on treatments. However, in the insurance envi-
ronment of Korea, the medical fees are relatively low, and in the
case of worker’s compensation or car insurance, the cost to the
patient is significantly reduced. Therefore, even though attempt-
ing reattachment surgery raises medical costs, it is possible for
clinicians to be more proactive in trying reattachment surgery.

The limitations of this study are that we did not investigate
cost-effectiveness and patient satisfaction in the context of func-
tional outcomes through retrospective research. In future stud-
ies, investigations of patient satisfaction and cost-effectiveness
to patients should be conducted. The reliability of statistical
analyses was insufficent due to the relatively small number of
cost comparisons possible between each trauma’s solidification
and coalescence. In addition, the cost calculation was based on
medical costs incurred at a single center, and only the cost of
initial primary care was calculated, so we were not able to in-
clude the costs of additional reoperations, making it difficult to
compare overall cost-effectiveness.

Conclusion

The success rate of replantation surgery has recently increased
due to the development of microsurgery, but when deciding on
a surgical method to treat traumatic limb amputation, factors
such as functional recovery, hospitalization period, and medical
expenses must be considered. Limb replantation surgery re-
quires more operations, longer hospital stays, and higher medi-
cal costs compared to revision amputation surgery. This differ-
ence in medical costs was more than twice as large when using
health insurance as for other payment methods. These results
may be used as reference material when considering character-
istics and medical costs as factors when deciding between treat-
ment methods for patients with traumatic limb amputations.

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Conflicts of interest

Sang Hyun Lee is the Deputy Editor of Archives of Hand and Microsurgery and was not involved in the review process of this article. There are no other conflicts of interest to declare.

Funding

This work was supported by clinical research grant from Pusan National University Hospital in 2024.

References