



Efficacy of Integrated Korean Medicine Treatment Including Motion-Style Acupuncture Treatment for L1 Burst Fracture and Bilateral Femoral Condyle, Proximal Tibial, and Proximal Fibular Comminuted Fractures: A Case Report

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This case report discusses a patient diagnosed with L1 burst fracture, right lateral femoral condyle and proximal tibial and fibular head and neck comminuted fractures, and left medial femoral condyle and suspected tibial fractures after a traffic accident. She received integrated Korean medicine treatment, including motion-style acupuncture treatment (MSAT), electroacupuncture, acupuncture, herbal medicine, moxibustion, and cupping therapy for 112 days. The scores improved for the low back pain Numeric Rating Scale (NRS) (from 7 to 3), Oswestry Disability Index (from 94 to 38), bilateral leg pain NRS (from 6 to 2), Lysholm Knee Scoring Scale (from 0 to 66), left ankle manual muscle test (from Poor- to Normal), Korean version of the modified Barthel index (from 32 to 92), and EuroQol 5-dimension 5-level (from 25 to 9), as did mobility. Radiological scans also showed fracture healing. This study suggests the potential of MSAT in high-energy polytrauma care, particularly for fractures.

Keywords: Burst fracture; Comminuted fracture; Korean traditional medicine; Motion-style acupuncture treatment; Multiple trauma

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INTRODUCTION

In high-energy polytrauma, severe musculoskeletal injuries are often accompanied with complex neurologic damage, requiring aggressive orthopedic intervention [1]. Motion-style acupuncture treatment (MSAT) involves needle insertion and patient movement; it improves neuromusculoskeletal conditions but has been understudied for fractures [2]. Among 29 studies on MSAT, no cases of fractures have been reported. Diseases in individual studies included herniated lumbar disc (10), lumbago (5), lumbar stenosis (1), piriformis syndrome (1), avascular necrosis of the femur head (1), ankylosing spondylitis + sacroiliitis + hip joint synovitis (1), facial asymmetry (2), temporomandibular disorder (1), whiplash injury (1), supraspinatus tendinitis (1), superior labrum anterior to the posterior lesion (1), bilateral epicondylitis (1), meniscal injury (1), knee arthritis (1), and peroneal nerve injury (1) [2]. This case study discusses a patient with polytrauma who received integrated Korean medicine, including MSAT.

CASE REPORT

1. Patient

1) Demographics

The patient was a woman in her 60s.

2) Chief complaint

Low back pain, bilateral leg pain, right leg hypoesthesia, and left foot drop.

3) Medical history

None.

4) Present illness

In 2023, the patient was hit by a car, and the front wheel ran over her thigh. She was transferred to the OO hospital and diagnosed with an L1 burst fracture, right lateral femoral condyle and proximal tibial and fibular head and neck comminuted fractures, and left medial femoral condyle and suspected tibial fractures. On onset day (OD) 4, she underwent posterior reduction and instrumentation fixation at T12–L2 and was asked to use thoracolumbosacral orthosis (TLSO) and long braces for both legs. On OD 19, she was transferred to the affiliated hospital.

5) Treatment period

The patient was hospitalized for 112 days (hospital day [HD] 112).

6) Radiology

T–L spine and bilateral knee magnetic resonance imaging, computed tomography, and X-ray were performed (Figs. 1–6).

2. Treatment

Acupuncture treatments were divided into three phases based on progress (Table 1) and performed twice daily using sterile disposable stainless-steel needles (0.20 × 30 mm; Haenglim Medical Co., Ltd.).

1) Motion-style acupuncture treatment

In phase 1 (HDs 1–43), the doctor dorsiflexed the left ankle 10 times after needling the right LI11. In phase 2 (HDs 44–84), the doctor supported left ankle dorsiflexion 10 times after needling the right LI11 and performed right knee flexion 10 times after needling the left SI3 and left BL62. In phase 3 (HDs 85–112), the patient flexed the right knee 10 times without support after the doctor needled the left LU5 and left LI4.



Fig. 1. T–L spine X-ray imaging. POD, postoperative day.

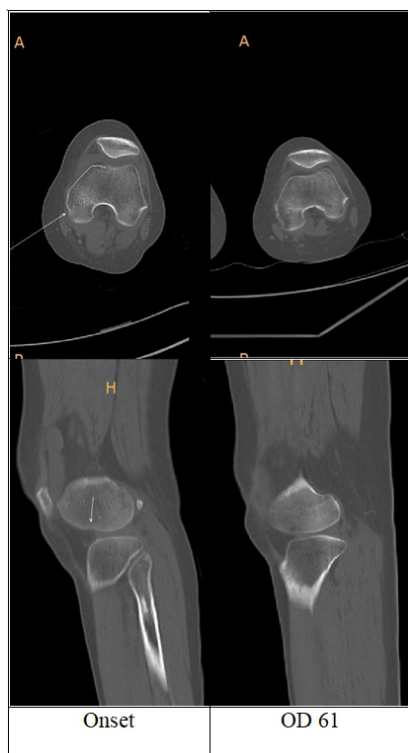


Fig. 2. Computed tomography of the left medial femoral condyle. OD, onset day: days after the onset.

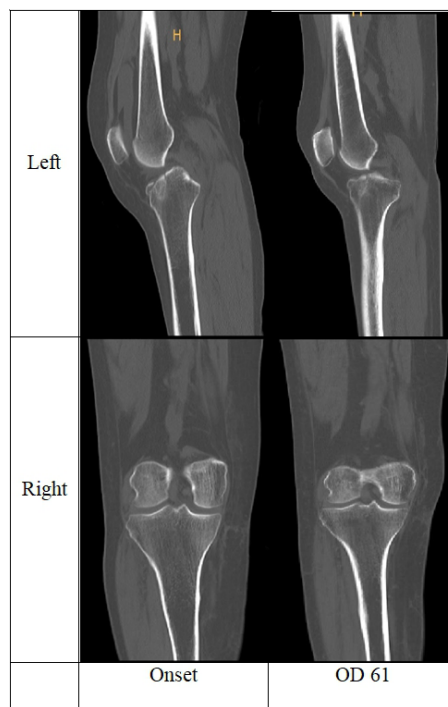


Fig. 4. Computed tomography of bilateral tibia. OD, onset day: days after the onset.

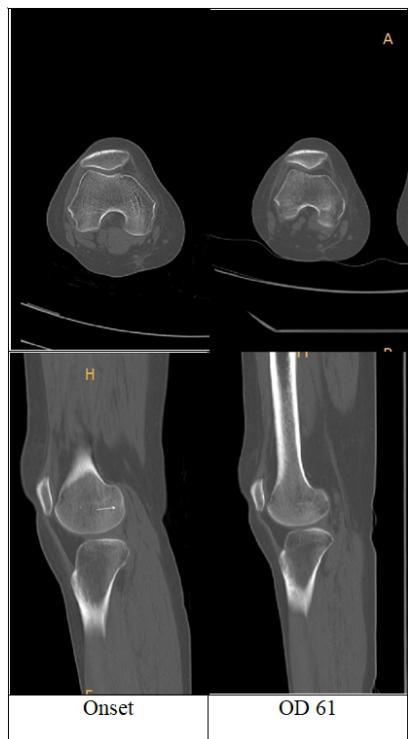


Fig. 3. Computed tomography of the right lateral femoral condyle. OD, onset day: days after the onset.



Fig. 5. Computed tomography of the right fibula. OD, onset day: days after the onset.

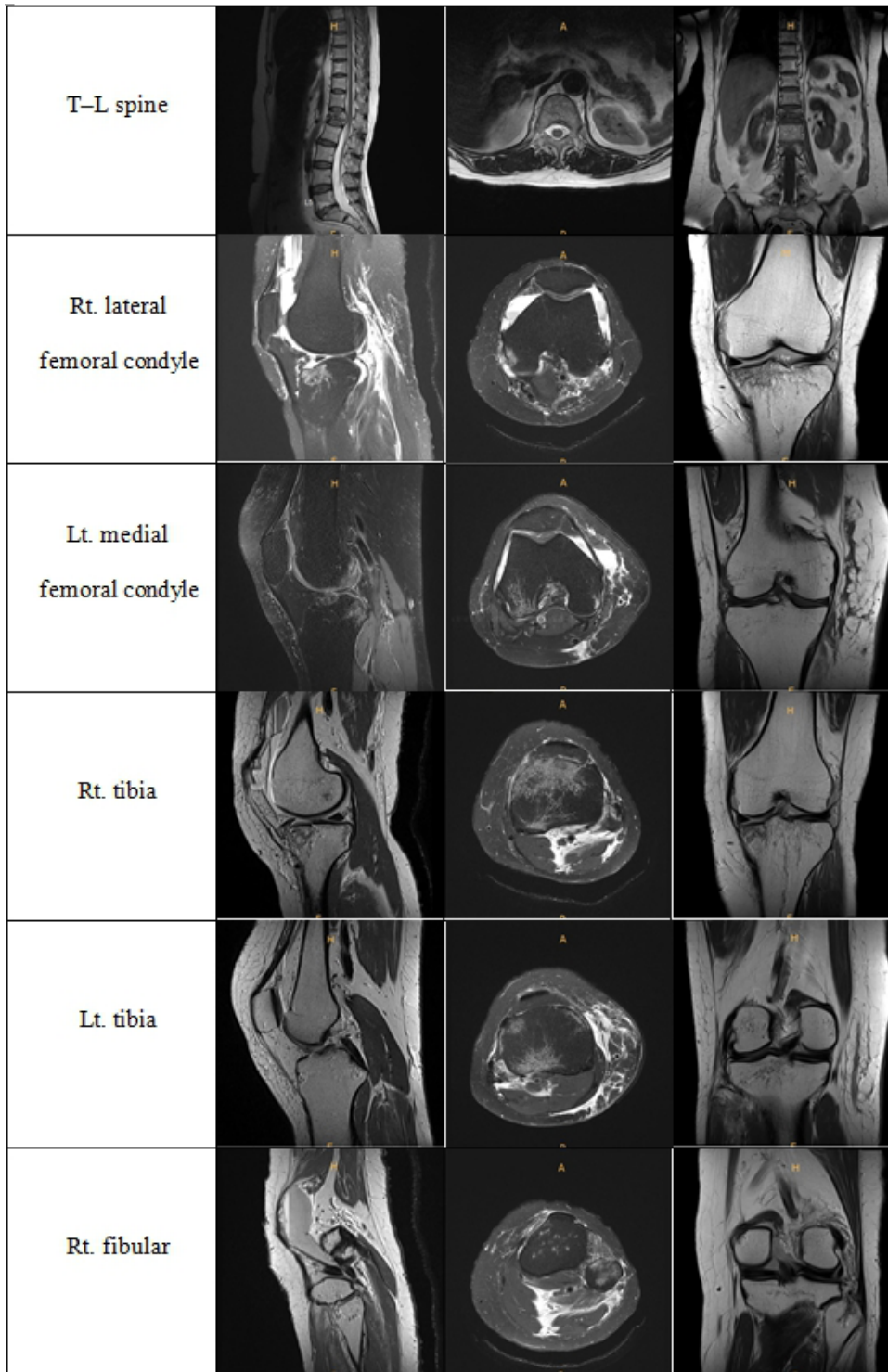


Fig. 6. Magnetic resonance imaging of the T-L spine and bilateral knee on onset. Rt., right; Lt., left.

2) Electroacupuncture

In phases 2-3, electroacupuncture (2 Hz) was performed on the left GB34-GB39 using STN-330 (StraTek Co., Ltd.) for 15 minutes.

3) Acupuncture

Acupuncture was accompanied with infrared therapy for 15 minutes after MSAT. In phase 1, acupuncture targeted the left GB41. In phases 2-3, it targeted the right SP9, ST36, and bilateral SP6.

4) Herbal medicine

The patient took Korean herbal medicine (Dohongsamul-tang-gami-bang, Hyangbujapalmul-tang-gami-bang, Uiiin-tang, and Binso-san) three times a day, with amounts being adjusted according to the patient's symptoms (Table 2).

5) Moxibustion & cupping therapy

Indirect moxibustion therapy (Yakssuksangsa Co., Ltd.) was administered on bilateral SP9, ST35, ST36, and EX-LE4 for 3 minutes each. After HD 20, shinkigoo (Dong-Bang Manufacturing Co., Ltd.) was used on CV4 and CV12 daily for 30 minutes, and bilateral trapezius dry cupping therapy was performed daily for 5 minutes.

3. Evaluation

1) Scales

Each symptom was assessed at admission, 2 weeks later, and monthly until discharge (Table 3). Low back pain was evaluated using the Numeric Rating Scale (NRS) and Oswestry Disability Index (ODI). Bilateral leg pain was evaluated using the NRS, Lysholm Knee Scoring Scale (LKSS), and bilateral knee range of motion (ROM). Right

leg hypoesthesia was compared with the left side for light touch and pinprick stimuli. Left foot drop was evaluated using the manual muscle test (MMT; Table 4) and left ankle ROM. Activities of daily living (ADLs) and quality of life (QOL) were evaluated using the Korean modified Barthel index (K-MBI) and EuroQol 5-dimension 5-level (EQ-5D-5L).

2) Patient's progress during treatment

In phase 1, the scores improved for low back pain NRS (from 7 to 5), ODI (from 94 to 76), bilateral leg pain NRS (from 6 to 4), LKSS (from 0 to 12), bilateral knee flexion (unmeasurable to 50°/70°), right medial leg sensory for pinprick (from 20% to 40%), MMT of the left ankle (from Poor- to Poor+), left ankle dorsiflexion (from -45° to -10°), K-MBI (from 32 to 52), and EQ-5D-5L (from 25 to 20). On HD #20, partial weight bearing was possible, and the patient stood up with railing support for 30 seconds to 1 minute.

In phase 2, the scores further improved for low back pain NRS (4), ODI (52), bilateral leg pain NRS (3), LKSS (36), bilateral knee flexion (100°/100°), right medial leg sensory for pinprick (60%), MMT of the left ankle (Fair), left ankle dorsiflexion (15°), K-MBI (82), and EQ-5D-5L

Table 1. Protocol of acupuncture treatment

	Motion-style acupuncture	Electroacupuncture	Acupuncture
Phase 1 (HDs 1-43)	Right LI11 → Left ankle pumps (P)	-	Left GB41
Phase 2 (HDs 44-84)	1) Right LI11 → Left ankle pumps (A) 2) Left SJ3, BL62 → Right knee flexion (A)	Left GB34-GB39	Right SP9, ST36, and bilateral SP6
Phase 3 (HDs 85-112)	Left LU5, LI4 → Right knee flexion (A)	Left GB34-GB39	Right SP9, ST36, and bilateral SP6

HD, hospital day; P, passive; A, active; -, not applicable.

Table 2. Herbal medicine prescription

Herbal prescription	Herbal medicine components (g/d)
Dohongsamul-tang-gami-bang (HDs 1-7)	<i>Drynariae Rhizoma</i> (8), <i>Dipsaci Radix</i> (8), <i>Atractylodis Rhizoma Alba</i> (8), <i>Cinnamomi Cortex</i> (8), <i>Angelicae Gigantis Radix</i> (8), <i>Rehmanniae Radix Recens</i> (4), <i>Paeoniae Radix</i> (4), <i>Persicae Semen</i> (4), <i>Carthami Flos</i> (4), <i>Cnidii Rhizoma</i> (4)
Dohongsamul-tang-gami-bang (HDs 8-30)	<i>Albiziae Cortex</i> (16), <i>Paeoniae Radix</i> (16), <i>Angelicae Gigantis Radix</i> (8), <i>Dipsaci Radix</i> (8), <i>Drynariae Rhizoma</i> (8), <i>Rehmanniae Radix Recens</i> (8), <i>Achyranthis Radix</i> (8), <i>Thujae Semen</i> (8), <i>Ostreae Testa</i> (8), <i>Fossilia Ossi Mastodi</i> (4), <i>Cypero Rhizoma</i> (4)
Hyangbujapalmul-tang-gami-bang (HDs 31-71)	<i>Paeoniae Radix</i> (16), <i>Cypero Rhizoma</i> (16), <i>Angelicae Gigantis Radix</i> (16), <i>Zingiberis Rhizoma</i> (12), <i>Zizyphi Fructus</i> (10), <i>Atractylodis Rhizoma Alba</i> (8), <i>Cynanchi Wilfordii Radix</i> (8), <i>Citri Unshius Pericarpium</i> (8), <i>Cnidii Rhizoma</i> (8), <i>Aucklandiae Radix</i> (6), <i>Achyranthis Radix</i> (6)
Uiiin-tang (HDs 72-85)	<i>Coicis Semen</i> (16), <i>Angelicae Gigantis Radix</i> (8), <i>Atractylodis Rhizoma</i> (8), <i>Paeoniae Radix</i> (6), <i>Cinnamomum Verum</i> (6), <i>Ephedrae Herba</i> (6), <i>Glycyrrhizae Radix</i> (4)
Binso-san (HDs 86-112)	<i>Atractylodis Rhizoma</i> (16), <i>Cypero Rhizoma</i> (8), <i>Citri Unshius Pericarpium</i> (8), <i>Osterici Radix</i> (8), <i>Chaenomelis Fructus</i> (8), <i>Arecae Semen</i> (8), <i>Perillae Folium</i> (8), <i>Achyranthis Radix</i> (8), <i>Zingiberis Rhizoma</i> (6), <i>Allii Fistulosi Bulbus</i> (6), <i>Glycyrrhizae Radix</i> (4)

HD, hospital day.

Table 3. Progress of evaluation

Part	Evaluation	Phase 1			Phase 2		Phase 3	
		Week 0	Week 2	Week 6	Week 10	Week 14	Week 16	
Lumbar pain	NRS	7	6	5	4	3	3	
	ODI	94	90	76	52	40	38	
Bilateral leg pain	NRS	6	5	4	3	2	2	
	LKSS	0	0	12	36	56	66	
	Knee flexion	N/T	40°/40°	50°/70°	100°/100°	120°/120°	120°/120°	
Right leg sensory	Light touch	20%	20%	20%	20%	60%	70%	
	Pinprick	20%	20%	40%	60%	80%	80%	
Left foot drop	MMT	2-	2+	2+	3	4	5	
	Dorsiflexion	-45°	-30°	-10°	15°	20°	20°	
ADLs	K-MBI	32	36	52	82	86	92	
QOL	EQ-5D-5L	25	24	20	13	10	9	

NRS, Numeric Rating Scale; ODI, Oswestry Disability Index; LKSS, Lysholm Knee Scoring Scale; N/T, not testable state; MMT, manual muscle test; ADLs, activities of daily living; K-MBI, Korean modified Barthel index; QOL, quality of life; EQ-5D-5L, EuroQol 5-dimension 5-level.

Table 4. Manual muscle test

Grade	Category	Function of the muscle
0	Zero (Z)	No visible or palpable muscle contraction
1	Trace (T)	Feel contraction with palpation; no visible movement
2-	P-	Less than full ROM in the gravity-eliminated plane
2	Poor (P)	Full ROM in the gravity-eliminated plane with no resistance
2+	P+	Full ROM in the gravity-eliminated plane, breaks upon minimum resistance
3-	F-	Less than full ROM against gravity, but > 50%
3	Fair (F)	Full ROM against gravity, with no resistance
3+	F+	Full ROM against gravity, breaks upon minimum resistance
4	Good (G)	Full ROM against gravity with moderate resistance
5	Normal (N)	Full ROM against gravity with maximum resistance

ROM, range of motion.

(13). TLSO and bilateral long leg braces were removed, and the patient was able to walk for approximately 100 m without assistance.

In phase 3, the scores improved for low back pain NRS (3), ODI (38), bilateral leg pain NRS (2), LKSS (66), bilateral knee flexion (120°/120°), right medial leg sensory for light touch (70%) and for pinprick (80%), MMT of the left ankle (Normal), left ankle dorsiflexion (20°), K-MBI (92), and EQ-5D-5L (9). The patient was able to practice walking on slopes and stairs.

DISCUSSION

Stable spinal fractures at the thoracolumbar junction (T11-L2) are often treated conservatively with a TLSO,

whereas unstable ones require surgery. Post surgery, patients wear a TLSO for 3 months, and the screw is removed after 1 year to reduce complications [3]. Distal femoral fractures, although rare, are severe and may require surgical intervention because of anatomical challenges. Nonoperative treatments must be carefully considered to avoid complications [4]. “Floating knee” fractures are managed conservatively when non-displaced and surgically when displaced, with postoperative immobilization and gradual weight bearing [5].

MSAT involves inserting needles to induce movement and relieve pain; however, needle bending can be uncomfortable [2]. In this case, distal acupoint selection based on the meridian theory was performed to relieve pain through the central nervous system activity without needle bending, thus, improving ROM, preventing defor-

mity, and promoting bone fusion.

The patient suffered from low back pain, bilateral leg pain, right leg hypoesthesia, and left foot drop caused by an L1 burst fracture and multiple leg fractures. Spinal cord injury was ruled out, and the L1 burst fracture was determined to be caused by a powerful extension force from behind (i.e., lumberjack injury) [3]. In Korean medicine, fractures are classified into early, middle, and late stages [6]. Here, the fractures were in the middle stage. Left foot drop was diagnosed as a common peroneal nerve injury [7].

The treatment was divided into three phases due to varying chief complaints, with goals adjusted according to progress in fracture healing, weight bearing, joint mobility, and orthosis removal [8]. Phase 1 aimed to manage pain and promote bone healing. Needling the right LI11 and moving the left ankle strengthened the Foot–Yangming meridian, where the tibial fracture was located, activating the common peroneal nerve [7-9]. Phase 2, focused on walking practice after orthosis removal, aimed to stabilize the lumbar spine, prevent knee joint stiffness, and enhance leg muscle strength. Needling the left SI3 and left BL62, classified as eight confluent points affecting the posterior aspect, was performed to activate the motor and neurological functions of the right leg [10]. Electroacupuncture on the left GB34–GB39 and acupuncture on the right SP9, ST36, and bilateral SP6 after MSAT promote nerve activation and blood flow [7,11]. Phase 3 aimed to increase the ambulation distance and restore ADLs. Needling the left LU5 and left LI4 and moving the right knee relaxed the Foot–Taiyang meridian, correlated with the Lung meridian, to alleviate knee joint stiffness [12].

After 112 days of integrated Korean medicine treatment, the patient showed significant improvements in pain, mobility, and QOL. Among 10 domestic clinical research studies on Korean medicine treatment for fractures of the thoracolumbar junction (4), tibia (5), fibula (1), and distal femur (0), three cases of multiple fractures have been reported [6,8,9,13-19]. ROM of one patient with fractures of the left tibia, fibula, and rib was not discussed [9]. In another case, a patient with T12–L1 fractures, bilateral calcaneus fractures, and spinal cord injury began walker ambulation at 58 weeks from onset [15]. In the other case, the patient with fractures of the pelvis, left tibia, and fibula began walker-ambulation at 9 weeks from onset [19]. In this case, the patient treated with MSAT began weight-bearing at 6 weeks and walker-ambulation at 8 weeks from onset, despite an initial prognosis of 12–14 weeks. The patient exhibited no ad-

verse reactions to Korean medicine, highlighting its safety and effectiveness in promoting natural healing. However, because of the absence of a control group, her improvement cannot solely be attributed to the treatment. Prospective observational or controlled studies are warranted to advocate the potential of MSAT after high-energy polytrauma.

AUTHOR CONTRIBUTIONS

Conceptualization: DDK. Data curation: DDK, SHJ. Formal analysis: DDK, SHJ. Investigation: DDK, SHJ. Methodology: DDK. Supervision: WYK. Visualization: DDK, SHJ. Writing – original draft: DDK. Writing – review & editing: All authors.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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None.

ETHICAL STATEMENT

This study was exempt from the Public Institutional Review Board Designated by Ministry of Health and Welfare (IRB no. P01-202404-01-046). Electronic medical records were used to analyze patient data, and written informed consent was obtained before study participation.

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