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Continuous Local Antibiotic Perfusion for Refractory Musculoskeletal Infections: Functional and Patient-reported Outcomes in a 13-Case Series

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Learning Point of the Article:

Continuous local antibiotic perfusion (CLAP) may be a feasible adjunctive treatment for refractory musculoskeletal infections, providing favorable infection control, functional recovery, and patient satisfaction.

Abstract

Introduction: Continuous local antibiotic perfusion (CLAP), a novel treatment for bone and soft-tissue infections, maintains high local antimicrobial concentrations while minimizing systemic toxicity. Despite its effectiveness against biofilm-related infections and ability to preserve implants, the clinical indications, protocols, and patient-reported outcomes remain unclear. This study assessed the clinical outcomes and patient satisfaction following CLAP for musculoskeletal infections of varied etiologies and anatomical sites.

Materials and Methods: This retrospective series included consecutive patients undergoing CLAP at a single institution between January 2020 and March 2025. Eligible patients had fracture-related infections, osteomyelitis, soft-tissue abscesses, or post-operative wound infections diagnosed according to the 2018 Musculoskeletal Infection Society criteria. CLAP comprised gentamicin (1.2 mg/mL) delivered through infusion combined with negative-pressure wound therapy. Intravenous antibiotics were administered based on culture and sensitivity results. Primary outcomes included additional surgical procedures after CLAP initiation. Secondary outcomes included infection resolution, length of hospital stay, functional recovery, and patient satisfaction, assessed using a structured Likert-scale survey and the net promoter score (NPS). Most patients had undergone prior surgical debridement and systemic antibiotic therapy, and CLAP was introduced as an adjunct or salvage treatment in cases with persistent or difficult-to-control infection. Infection clearance was defined as the absence of clinical signs of infection, wound healing, and no requirement for further surgical intervention. Functional recovery was defined according to ambulation status in lower-extremity cases and ability to perform activities of daily living in upper-extremity cases.

Results: Thirteen patients (median age, 75 years; 76.9% men) were included. Infections comprised fracture-related infection (n=8), osteomyelitis (n=2), and soft-tissue infection (n=3). Median CLAP duration was 21 days, and median hospital stay was 69 days. Infection clearance was achieved in 12 patients (92%) within a median of 37 days. Six patients (46.2%) required implant removal, and the median number of additional procedures was four. Functional recovery was good or partial in nine patients (69.3%). Satisfaction was high: 84.6% indicated that they would undergo the procedure again, and the mean NPS was 8.2, with no detractors. Implant removal was mainly performed because of persistent infection or compromised bone and soft-tissue conditions. In fracture-related infection cases, radiographic bone healing and clinical pain improvement were also observed during follow-up.

Conclusion: CLAP achieved high infection-clearance rates and favorable functional and satisfaction outcomes, supporting its feasibility as an adjunctive option within surgical and systemic antibiotic management for refractory musculoskeletal infections.

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Introduction

Continuous local antibiotic perfusion (CLAP) is an emerging therapeutic approach for bone and soft-tissue infections designed to eradicate biofilms by maintaining sustained, high local concentrations of antimicrobial agents at the infection site [1]. Unlike systemic antibiotic therapy, CLAP delivers concentrations exceeding the minimum biofilm eradication threshold while minimizing systemic exposure and adverse effects such as nephrotoxicity and ototoxicity [2]. Preclinical and early clinical studies have shown that continuous local administration of gentamicin at 1.2 mg/mL achieves levels sufficient to disrupt biofilms in bone and soft-tissue environments [3]. Importantly, CLAP may enable infection control without implant removal, making it a promising option for implant-associated refractory infections [2]. Although treatment outcomes have been investigated, patient satisfaction has not been reported.

CLAP therapy has demonstrated efficacy in chronic osteomyelitis and implant-related infections; however, its effectiveness in acute or extensive infections remains uncertain [4]. Clinical indications – such as infection type, anatomical site, and optimal timing – are yet to be clearly defined. Furthermore, treatment variables, including antibiotic selection, concentration, and perfusion protocols, lack standardization. While favorable results have been described in individual cases, existing evidence is constrained by small cohorts and the absence of prospective or randomized studies. Broader evaluation across diverse clinical presentations is necessary to clarify the therapeutic scope and limitations of CLAP therapy.

This study describes the treatment methods and clinical courses of patients who received CLAP therapy for fracture-related and soft-tissue infections. The series encompasses various anatomical sites and infection types – including phalangeal osteomyelitis, femoral osteomyelitis, soft-tissue abscesses, and postoperative wound infections – allowing comparative analysis of CLAP effectiveness across different clinical contexts. Although the sample size is modest, inclusion of more than ten cases permits preliminary statistical evaluation. In addition, three questionnaire items were used to assess patient satisfaction, with responses obtained directly from patients.

Materials and Methods

Study design

This retrospective case series was conducted at a single institution. This study was approved by the Clinical Ethics Committee of Chubu Rosai Hospital on October 27, 2025. No approval number was assigned by the committee. All patients provided written informed consent.

Table 1: Patient characteristics

Case	Age	Sex	Comorbidities	Infection characteristics				Causative microorganism			
				Infection type	Primary infection site (where CLAP is used)	Associated infection	Other sites (1)	Bacteria type	Bacteria type (2)	Bacteria type (3)	Bacteria type (4)
1	65	Male	Spinal cord injury	FRI	Right ankle joint	Trimalleolar fracture		*MRSA*			
2	86	Male	Dialysis	FRI	Right femoral condyle	Right femoral transverse fracture		*Undetected*			
3	87	Female	Diabetes mellitus	FRI	Left elbow head	Olecranon fracture		*Enterococcus faecalis*	*Enterococcus faecalis*	*Proteus penneri*	*MRSA*
4	48	Male	None	FRI	Left heel	Left calcaneus fracture		*MRSA*			
5	73	Male	Dialysis	FRI	Right ankle joint	Pilon fracture		*MRSA*	*MRSE*		
6	72	Female	Diabetes mellitus	FRI	Right femoral condyle	Femoral condyle fracture		*MRSA*			
7	81	Male	Dialysis	FRI	Right ankle joint	Bimalleolar fracture		*Staphylococcus aureus*	*Escherichia coli*		
8	90	Male	None	FRI	Right ankle joint	Lateral malleolus fracture		*Staphylococcus aureus*			
9	75	Male	Diabetes mellitus	Soft tissue infection	Right middle finger and wrist	Septic arthritis of the wrist		*Streptococcus agalactiae*	*Citrobacter koseri*		
10	77	Male	Dialysis	Soft tissue infection	Right middle finger	Cellulitis of the middle finger		*Staphylococcus lugdunensis*			
11	87	Female	None	Soft tissue infection	Right lower leg	Post-fall acne/hematoma		*MSSA*	*Pseudo aeruginosa*	*Corynebacterium*	*Prevotella oralis*
12	67	Male	Spinal cord injury	Chronic osteomyelitis	Right lower leg	Right lower leg cellulitis	ARDS associated with osteomyelitis	*Staphylococcus caprae*			
13	22	Male	None	Chronic osteomyelitis	Left femoral femur	Femoral osteomyelitis		*Staphylococcus aureus*			***Staphylococcus aureu***

CLAP: Continuous local antibiotic perfusion, FRI: Fracture-related infections, MRSA: Methicillin-resistant *Staphylococcus aureus*, MRSE: Methicillin-resistant Staphylococcus epidermidis

Patient selection

Consecutive patients with bone or soft-tissue infections who underwent CLAP therapy between January 2020 and March 2025 were included. Patients were excluded if the data were incomplete or if the duration of perfusion was <7 days. Most patients had undergone prior surgical debridement and systemic antibiotic therapy. CLAP was introduced as an adjunct or salvage treatment in cases with persistent or difficult-to-control infection.

Diagnosis

Infections were diagnosed according to the 2018 Musculoskeletal Infection Society criteria, The 2018 definition of Periprosthetic Hip and Knee Infection: An Evidence-Based and Validated Criteria [5]. Included conditions comprised fracture-related infections (FRIs), osteomyelitis, soft-tissue abscesses, and post-operative wound infections.

CLAP therapy protocol

CLAP therapy was administered using a double-lumen tube placed at the infection site connected to an external pump delivering continuous antibiotic perfusion. Gentamicin (1.2 mg/mL) was the primary agent in most cases. Negative-pressure wound therapy was combined with CLAP to allow continuous circulation, with exudate and residual antibiotic solution drained and collected. The perfusion period was typically 1–2 weeks. Intravenous antibiotics were co-administered according to bacterial culture and sensitivity results at the physician's discretion.

Outcome measures

The primary outcome was the number of additional surgical procedures (e.g., debridement, implant removal, revision) required following CLAP initiation. Infection clearance was defined as the absence of clinical signs of infection (e.g., no drainage, erythema), wound healing, and no requirement for further surgical intervention for infection control. In fracture-related infection cases, bone healing was assessed using serial plain radiographs and clinical findings, including pain improvement during weight-bearing or activity. Secondary outcomes included hospital stay length, systemic antibiotic duration, post-operative functional status (walking ability for lower-extremity cases and hand function for upper-extremity cases), and patient satisfaction. Functional recovery was defined as: Lower extremity: Ambulation status compared to pre-injury level and upper extremity: Ability to perform activities of daily living.

Patient satisfaction was assessed through a structured telephone survey using Likert scale-based questions (five-point scale: 1 = very dissatisfied to 5 = very satisfied, with higher scores indicating greater satisfaction) and the net promoter score (NPS) (single-item question: 0 = not at all likely to 10 = extremely likely to recommend; scores ≥9 = promoters, 7–8 = passives, and ≤6 = detractors, with higher scores reflecting greater likelihood of recommending the treatment) [6,7,8].

Statistical analysis

Table 2: Treatment details

Case	Time until infection treatment begins (days)	Infection phase	Intravenous antibiotic choice_1	Antibiotic dosage	Antibiotic administration interval	Intravenous antibiotic choice_2	iMAP/iSAP/iJAP	Time until CLAP treatment begins (days)	Duration of CLAP (days)	Number of surgeries including debridement	Procedure type	Reason for Implant Removal
1	0	Acute	VCM	0.5q	q8h		iSAP	479	Lateral malleolus: 21, Medial malleolus: 15	7	Open reduction and internal fixation	Persistent infection
2	0	Acute	CTRX	1g	q24h		iMAP	8	15	3	Debridement	Persistent infection
3	0	Acute	pip/taz	4.5g	q8h	VCM	iSAP(iJAP)	8	15	6	Open reduction and internal fixation and skin graft	Persistent infection
4	0	Acute	VCM	0.5g	q12h		iMAP	10	14	5	Open reduction and internal fixation	Compromised soft tissue
5	13	Acute	Tazobactam/ceftolozane	1.5g	q12h	AMK	iMAP	90	26	6	Open reduction and internal fixation and ankle arthrodesis	Mechanical instability
6	0	Chronic	TAZ/PIPC	4.5g	q12h		iMAP	436	21	4	Open reduction and internal fixation	Persistent infection
7	0	Chronic	CEZ	2g	q12h	CTRX	iSAP	21	13	4	Open reduction and internal fixation	No
8	3	Acute	CEZ	1g	q8h		iSAP	3	14	2	None	No
9	5	Acute	CEZ	2g	q8h		iSAP	28	21	6	None	
10	23	Acute	VCM	0.5g	q12h		iSAP	87	14	3	None	
11	0	Acute	CEZ	2g	q8h	PIPC2g iv q6h	iSAP	7	15	3	None	
12	0	Acute	ABPC	2g	q12h	VCM	iMAP	31	15	2	None	
13	20	Chronic	CEZ	2g	q8h	VCM	iSAP+iMAP	12	14	4	None	

iMAP: intramedullary antibiotic perfusion
iSAP: intra-soft tissue antibiotic perfusion
iJAP: intra-articular antibiotic perfusion

Descriptive statistics were used to summarize patient demographics, treatment characteristics, and outcomes.

Clinical trial number

Not applicable.

Results

Thirteen consecutive patients were included. Patient demographics and infection characteristics are summarized in Table 1. The median age was 75 years (IQR 67–86, range 22–90), and 10 patients (76.9%) were male. Comorbidities included chronic kidney disease requiring dialysis in four patients (30.8%), diabetes mellitus in three (23.1%), and spinal cord injury in two (15.4%), while four (30.8%) had no significant comorbidities. FRI was the most common condition (eight cases, 61.5%), followed by chronic osteomyelitis (two cases, 15.4%) and soft-tissue infection (three cases, 23.1%). Ten cases (76.9%) were acute, and three (23.1%) were chronic. Causative pathogens included Staphylococcus aureus (MSSA and MRSA), Enterococcus faecalis, and Pseudomonas aeruginosa.

Treatment details are shown in Table 2. The median CLAP duration was 21 days (interquartile range [IQR] 8–31). Patients underwent a median of four additional surgical procedures (IQR 3–6), comprising both major procedures – such as implant removal, open reduction and internal fixation, arthrodesis, and skin grafting – and minor procedures, including repeated debridement, drainage, and wound irrigation. Implant removal was required in six cases (46.2%). Reasons for implant removal included persistent infection, mechanical instability, and compromised bone or soft-tissue conditions.

Clinical outcomes are summarized in Table 3. The median time to infection clearance was 37 days (IQR 27.5–53.5, range 14–85), and the median hospital stay was 69 days (IQR 42–74, range 21–206). Functional recovery was classified as good in five patients (38.5%), partial in four (30.8%), and poor in four (30.8%). Patient satisfaction was generally high: Four patients (30.8%) were very satisfied, seven (53.8%) satisfied, and two (15.4%) neutral. The mean NPS was 8.2, with four patients (30.8%) identified as promoters, nine (69.2%) as passives, and none as detractors. When asked whether they would undergo CLAP therapy again, 11 patients (84.6%) responded "Yes," and two (15.4%) answered "Not sure." In fracture-related infection cases, radiographic bone healing and clinical pain improvement were confirmed during follow-up in evaluable patients.

Discussion

In this retrospective case series, CLAP therapy achieved high infection eradication and favorable functional recovery across musculoskeletal infections. Among 13 patients with acute and chronic infections, including FRI, osteomyelitis, and soft-tissue infection, the median CLAP duration was 21 days, and infection clearance was achieved in most cases within a median of 37 days. Approximately half required implant removal, with a median of four additional surgical procedures. Functional recovery was generally good, and patient satisfaction was high,

Table 3: Outcomes

Case	Time for infection clearance (days)	Time to clinical improvement (days)	Tier	Functional recovery	Likert scale-based satisfaction questions	Net promoter score	Knowing what you know now, would you choose to undergo this surgery again?	Length of hospital stay (days)
1	60	39	3B	Discharged from hospital with independent walking	Satisfied	8	Yes	44
2	34	34	1	Hospital transfer	Very satisfied	9	Yes	72
3	47	33	3D	Hospital transfer	Satisfied	8	Yes	74
4	41	14	1	Leaving hospital at home	Neutral	7	Not sure	72
5	None	None	3D	Sustained wound drainage	Satisfied	8	Yes	206
6	None	None	4B	Death	Satisfied	8	Yes	42
7	60	45	3D	Walking without assistance	Very satisfied	9	Yes	65
8	17	17	1	Walking without assistance	Very satisfied	9	Yes	21
9	85	85	2	Limited range of motion	Very satisfied	10	Yes	96
10	27	27	2	Limited range of motion	Satisfied	8	Yes	36
11	37	15	1	Walking without assistance	Satisfied	8	Yes	69
12	14	14	1	Wheelchair and home discharge	Neutral	7	Not sure	80
13	28	28	2	Walking without assistance	Satisfied	8	Yes	39

with most respondents indicating willingness to undergo the therapy again. These findings suggest that CLAP therapy can be an effective and well-accepted option for managing musculoskeletal infections.

This study should be interpreted as an exploratory descriptive case series reflecting real-world clinical practice rather than a comparative study establishing definitive treatment indications. CLAP should not be interpreted as a guarantee of implant retention, particularly in severe or complex infections.

Infection eradication was achieved in 12 of 13 cases (92%), with a median clearance time of 37 days, indicating that CLAP can provide effective infection control within a relatively short duration. Conventional regimens for osteomyelitis or implant-associated infections typically require parenteral antibiotic courses lasting 4–6 weeks or longer. Compared with systemic therapy, completing infection treatment in a shorter period may reduce complications such as antibiotic resistance and diminished patient ADL. This favorable infection control may be explained by the ability of CLAP to maintain sustained high local antibiotic concentrations that exceed biofilm eradication thresholds while minimizing systemic exposure.

Our findings align with previous reports on CLAP. A multicenter study on spinal surgical site infections reported an 81% implant retention rate with CLAP therapy, although infection types in that study were more limited [1]. In our cohort, seven FRI cases were included; despite higher case complexity, eradication rates were similarly high, though treatment duration was slightly longer. Infection control was also achieved in osteomyelitis and soft-tissue infections, demonstrating the broader applicability of CLAP beyond implant-related infections. Specifically, three osteomyelitis cases achieved remission, extending the observations of Oe et al. (2021), who reported successful outcomes in chronic osteomyelitis. Likewise, three cases of soft-tissue infections were successfully treated, consistent with the results of Takahashi et al. (2025), who achieved an 81% implant retention rate in spinal surgical site infections. These outcomes suggest that CLAP therapy may be effective across a wide spectrum of musculoskeletal and soft-tissue infections, irrespective of anatomical site or chronicity. These findings suggest that CLAP may have broader applicability as an adjunctive strategy across different musculoskeletal infection settings.

The need for implant removal and the number of additional surgical procedures were relatively low compared with conventional management. In prior CLAP case series, implant removal rates have often been reported as negligible.

In a previous series of nine FRI cases, all implants were preserved, with infection eradication achieved in all patients [10]. In contrast, 46.2% of our cases required implant removal, reflecting a higher surgical burden due to greater case diversity and severity. In several patients, implant removal was unavoidable because of extensive infection or compromised bone and soft-tissue integrity. Hieda et al. [10] reported a 90.9% implant survival rate in hip periprosthetic joint infection (PJI) treated with debridement, antibiotics, and implant retention (DAIR) plus CLAP, compared with 70% in non-CLAP controls. These comparisons suggest that while CLAP can reduce implant removal relative to standard therapy, outcomes depend on infection complexity and comorbidities. Accordingly, implant preservation should be regarded as a potential advantage in selected cases rather than an expected outcome of CLAP.

Functional recovery and patient-reported satisfaction were also favorable. The need for implant removal and the number of additional surgeries were modest compared with traditional approaches. In our series, implant removal was necessary in 46.2% of cases, and the median number of additional procedures was four (IQR 3–6). By contrast, conventional treatment of chronic osteomyelitis or implant-associated infections often requires multiple operations. Jerzy et al. reported an average of 1.5 operations (range 1–5) per patient in non-implant osteomyelitis, while Piuzzi et al. described frequent complications and reoperations during staged revisions for PJI. These comparisons suggest that CLAP may lower surgical burden while maintaining infection control. However, the number of additional procedures should be interpreted primarily as a surrogate of treatment burden rather than as a direct efficacy endpoint.

Few previous studies have systematically evaluated patient-reported outcomes after CLAP therapy. Kosugi et al. reported that CLAP enabled infection control without extensive tissue resection in FRI, supporting functional preservation. Similarly, Hieda et al. found that CLAP allowed implant retention and favorable function compared with conventional DAIR alone. Together, these findings suggest that CLAP supports both infection control and functional recovery, although patient-centered outcomes remain underreported. In our study, both the Likert satisfaction score (mean 4.1/5) and the NPS (mean 8.2) reflected strong patient acceptance, with most patients willing to undergo the procedure again. Kosugi et al. suggested that CLAP preserves function by minimizing tissue damage, yet patient perspectives were not assessed. Hieda et al. demonstrated favorable function after CLAP in PJIs; however, subjective satisfaction data were lacking. Our findings provide new evidence that CLAP not only achieves infection eradication and functional recovery but is also associated with high patient-reported satisfaction – an aspect seldom addressed previously. Patient-reported outcomes should therefore be

interpreted as complementary measures and not as substitutes for objective clinical or functional endpoints.

This study has several strengths and novel contributions. First, unlike earlier disease-specific or small-scale reports, this series included a heterogeneous cohort encompassing FRI, osteomyelitis, and soft-tissue infections, many in patients with comorbidities such as dialysis dependence and spinal cord injury. To our knowledge, no prior study has systematically reported such a diverse population with detailed data on pathogens, infection phase (acute vs. chronic), and antibiotic regimens, reflecting the real-world spectrum of refractory musculoskeletal infections.

Second, this study uniquely incorporated patient-centered outcomes, including functional recovery, discharge status, and satisfaction assessed by validated tools such as the Likert scale and the NPS. Such outcomes are seldom evaluated in CLAP research but are vital for assessing treatment value. To our knowledge, no prior report has systematically examined patient satisfaction after CLAP therapy. Earlier studies have emphasized infection eradication and implant retention but rarely considered patient experience or perceived benefit. By quantifying satisfaction and willingness to repeat the procedure, our findings provide the first empirical evidence of CLAP acceptability from the patient's perspective. This approach advances the integration of patient-reported outcomes into musculoskeletal infection research, bridging the gap between clinical success and patient-perceived benefit.

Clinically, these results indicate that CLAP therapy is effective for infection eradication and feasible in patients with complex comorbidities and varied infection types. Favorable functional and satisfaction outcomes support its value as an adjunct to surgical and systemic antibiotic management in musculoskeletal infections. In fracture-related infection, bone union remains a critical goal; the radiographic bone healing and pain improvement observed in follow-up support the need to incorporate union-related outcomes in future studies.

This study has several limitations that warrant acknowledgment. First, the number of cases was relatively small. Second, this was a retrospective case series without a control group, preventing direct comparison with patients managed without CLAP therapy. In addition, selection bias is possible, as CLAP was preferentially used in cases where implant retention was considered feasible, whereas patients for whom implant preservation was not possible may have been underrepresented. Third, the availability of long-term outcomes was inconsistent. Some patients lacked extended follow-up, hindering full assessment of the durability of infection control and prevention of reinfection after completion of CLAP therapy. Fourth, the single-center setting in Japan may limit generalizability as the patient population, comorbidity patterns, causative organisms, and healthcare resources may differ from those in other regions. Additional limitations include cohort heterogeneity, lack of a standardized CLAP protocol, absence of validated functional outcome scores, limited formal safety evaluation regarding systemic gentamicin exposure, and incomplete long-term assessment of recurrence and bone union.

Conclusion

CLAP therapy achieved infection clearance in most musculoskeletal infections, including fracture-related infections, osteomyelitis, and soft-tissue infections. Although additional surgical procedures and implant removal were often required, functional recovery and patient satisfaction were generally favorable. These findings suggest that CLAP is a feasible adjunctive option for managing complex musculoskeletal infections. Further studies are needed to establish standardized indications and treatment protocols.

Clinical Message

Continuous local antibiotic perfusion (CLAP) may be a useful adjunctive treatment for refractory musculoskeletal infections, achieving favorable infection control while preserving function and supporting patient satisfaction.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Kosugi K, Zenke Y, Sato N, Hamada D, Ando K, Okada Y, et al. Potential of continuous local antibiotic perfusion therapy for fracture-related infections. Infect Dis Ther 2022;11:1741-55.

2. Iwamoto K, Yamamoto N, Saiga K, Maruo A, Noda T, Kawasaki K, et al. Prosthetic joint infection after total talar replacement: An implant-retained case treated with combined

continuous local antibiotic perfusion (CLAP). J Orthop Sci 2024;29:349-53.

3. Takahara S, Maruo A, Takayama H, Harada T. Continuous local antibiotics perfusion therapy for acute deep infections after open fractures. Case Rep Orthop 2022;2022:2563939.

4. Maruo A, Oda T, Mineo R, Miya H, Muratsu H, Fukui T, et al. Continuous local antibiotic perfusion: A treatment strategy that allows implant retention in fracture-related infections. J Orthop Surg (Hong Kong) 2022;30:10225536221111902.

5. Parvizi J, Tan TL, Goswami K, Higuera C, Della Valle C, Chen AF, et al. The 2018 definition of periprosthetic hip and knee infection: An evidence-based and validated criteria. J Arthroplasty 2018;33:1309-14.e2.

6. Zammit M, Siau R, Williams C, Hussein A. Patient satisfaction from ENT telephone consultations during the coronavirus disease 2019 pandemic. J Laryngol Otol 2020;134:917-924.

7. Allen AZ, Zhu D, Shin C, Glassman DT, Abraham N, Watts KL. Patient satisfaction with telephone versus video-televisits: A cross-sectional survey of an urban, multiethnic population. Urology 2021;156:110-6.

8. Krol MW, De Boer D, Delnoij DM, Rademakers JJ. The net promoter score-an asset to patient experience surveys? Health Expect 2015;18:3099-109.

9. Besal R, Adamič P, Beović B, Papst L. Systemic antimicrobial treatment of chronic osteomyelitis in adults: A narrative review. Antibiotics (Basel) 2023;12:944.

10. Hieda Y, Choe H, Maruo A, Abe K, Shimoda M, Ike H, et al. Clinical outcomes of continuous local antibiotic perfusion in combination with debridement antibiotics and implant retention for periprosthetic hip joint infection. Sci Rep 2025;15:26017.

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