

Unexpected Positive Intraoperative Cultures (UPIC) at Index Osseointegration Do Not Lead to Increased Postoperative Infectious Events — A Follow-Up Study

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130
LIMBS

125
PATIENTS

17 (13.1%)
UPIC COHORT

113 (86.9%)
NIC COHORT

BACKGROUND

Infection is the most common complication after transcutaneous osseointegration limb replacement. While the permanent skin portal is the most likely contamination route, intraoperative contamination is another potential source.

A 2022 pilot study from our center (n = 30) found that unexpected positive intraoperative cultures (UPIC) did not increase postoperative infection — but was limited by small sample size.

This follow-up study reassesses the relationship between UPIC and postoperative infection risk in a cohort more than four times larger.

METHODS

- Retrospective review of institutional osseointegration registry, October 2017
- October 2023
- Press-fit titanium transcutaneous nail (TiTON); ≥ 1 year follow-up required
- 5 intraoperative culture swabs per case (5-day aerobic / 14-day anaerobic incubation)
- UPIC → targeted postoperative antibiotics per culture sensitivities
- NIC → standard 24-hour antibiotic prophylaxis only
- Outcome graded 0–3 (none → antibiotics → debridement → implant removal)
- Fisher’s exact test for frequencies; paired t-test for continuous variables ($\alpha = 0.05$)

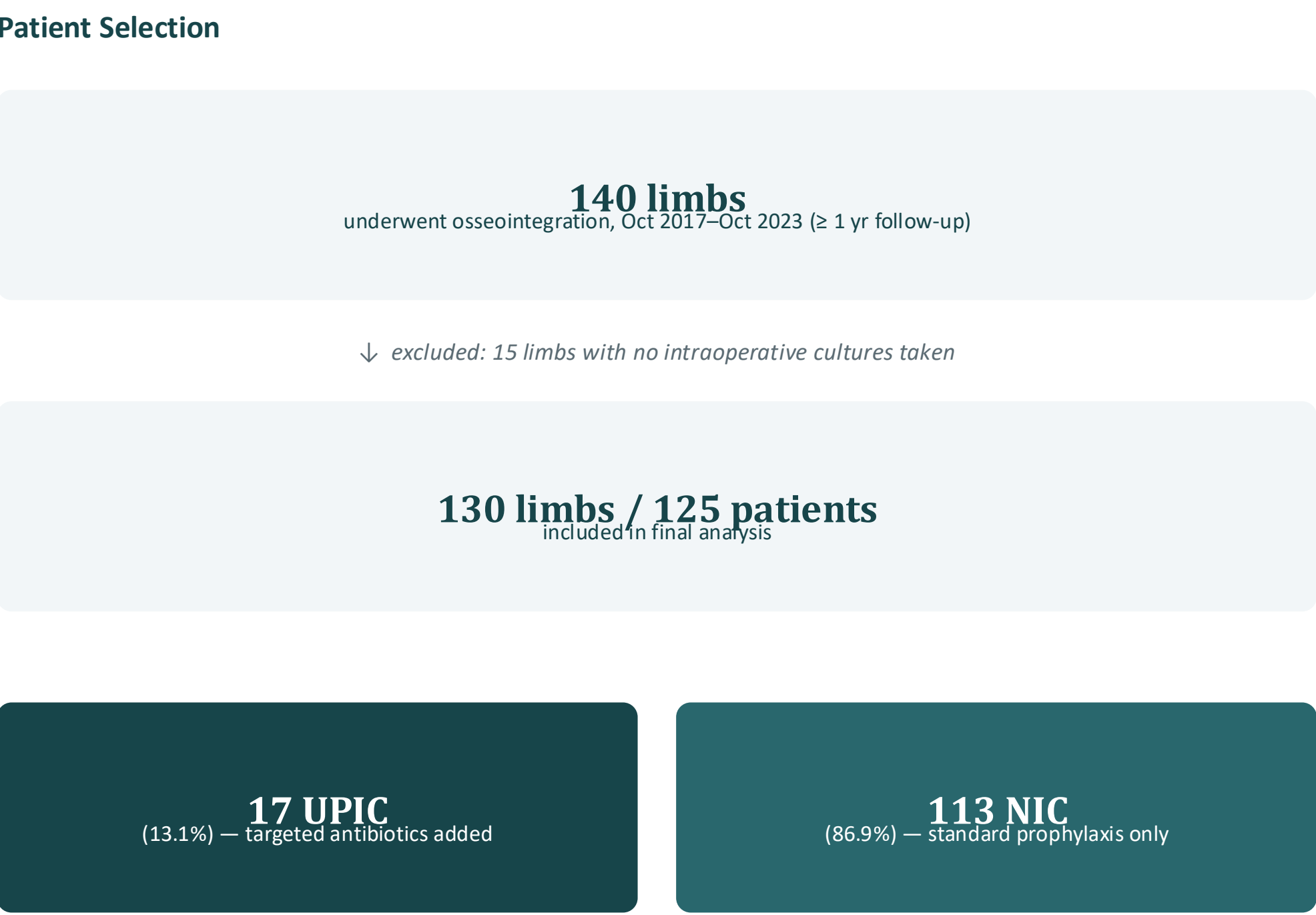


Table 1. Postoperative Infection Grading System

Grade	Features	Management
0	No infection features	None
1	Stoma erythema and/or tenderness and/or minor leakage	Oral antibiotics
2	Stoma leakage, painful weight bearing, sinus tract, or peri-implant osteolysis	Operative debridement, implant retained
3	Same as Grade 2, plus gross implant motion	Operative debridement, implant removal

Patients with UPIC received the same grading framework, with targeted antibiotics added at Grade 0 based on culture sensitivities rather than clinical signs.

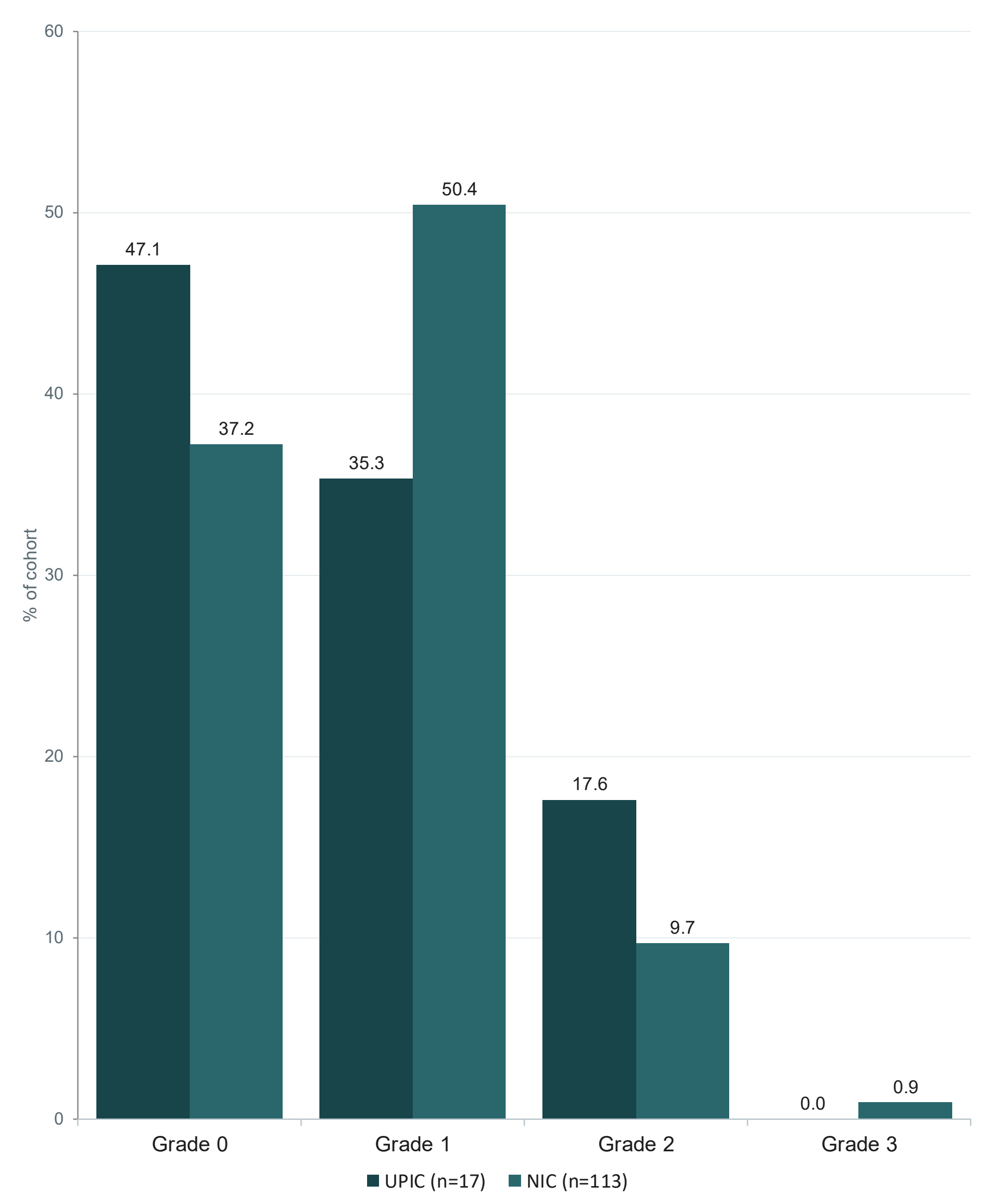
RESULTS

A total of 130 limbs in 125 patients met inclusion criteria. Cohorts (UPIC vs. NIC) did not differ significantly in gender, BMI, weight, laterality, etiology, tobacco use, staging, implant characteristics, or preoperative ESR/CRP. Patients with UPIC were significantly older at index amputation.

Table 2. Selected Demographics

Variable	UPIC (n=17)	NIC (n=113)	p
Age at OI, yrs	53.3 ± 11.4	47.5 ± 13.7	0.06
Age at amputation	46.0 ± 13.7	38.5 ± 16.2	0.041
Female	2 (11.8%)	33 (29.2%)	0.131
BMI	28.9 ± 6.2	29.2 ± 6.2	0.827
Trauma etiology	10 (58.8%)	85 (75.2%)	0.185
Preop ESR ≥ 15	3 (17.6%)	25 (22.1%)	0.591
Preop CRP ≥ 1	4 (23.5%)	16 (14.2%)	0.437

Figure 1. Postoperative Infection Grade Distribution



No statistically significant difference between cohorts at any grade (all Fisher’s $p \geq 0.30$, except Grade 0 $p = 0.44$).

Table 4. Infection Grade by Implant Site (UPIC + NIC combined)

Site (n)	Grade 0	Grade 1	Grade 2	Grade 3
Humerus (3)	2 (66.7%)	0	1 (33.3%)	0
Femur (75)	29 (38.7%)	34 (45.3%)	12 (16.0%)	0
Tibia (52)	21 (40.4%)	29 (55.8%)	1 (1.9%)	1 (1.9%)

Higher-grade events were infrequent across all implant sites, with no clear site-specific pattern distinguishing UPIC from NIC.

KEY FINDING

Targeted-antibiotic management of UPIC does not increase the risk of subsequent infection intervention after osseointegration.

Table 3. Most Common Organisms Cultured in UPIC (n = 17, some polymicrobial)

Organism	Patients
<i>Staphylococcus epidermidis</i>	7 (41%)
<i>Staphylococcus aureus</i> / MRSA	3 (18%)
<i>Staphylococcus capitis ureolyticus</i>	2 (12%)
Other Gram-negative / anaerobic (single cases)	7 (41%)

Regimens were culture-guided and typically continued for 6 weeks (range 10 days–8 weeks), combining oral and/or intravenous agents per infectious disease consultation.

DISCUSSION

- Confirms 2022 pilot findings in a cohort > 4× larger
- Sample size remains the key strength over the original 2022 study (8 UPIC / 22 NIC)
- No antibiotic-related adverse events (e.g., *C. difficile* colitis) observed
- All UPIC patients received targeted antibiotics — the isolated effect of treatment vs. culture status cannot be separated
- Every UPIC patient was treated, so intraoperative swabbing cannot be called unnecessary
- Necessity of routine intraoperative culturing remains unresolved
- Future work: assess whether antibiotic treatment of UPIC is truly required

CONCLUSIONS

With a larger, more definitive cohort, unexpected positive intraoperative cultures identified at index osseointegration — when managed with targeted postoperative antibiotics — do not appear to increase the likelihood of subsequent infection intervention. Whether routine culturing or antibiotic treatment is truly necessary remains an open question for future prospective study.

SELECTED REFERENCES

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