Usefulness of Antimicrobial Stewardship Team Intervention in Orthopedic Surgery

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INTRODUCTION: Orthopedic surgery related infections are often difficult to treat[1,2)], and the increase of drug-resistant bacteria due to inappropriate antimicrobial use is an international problem[3)]. Our Orthopedic department has conducted a conference a weekly meeting with our hospital's Antimicrobial Stewardship Team (AST) since December 2019(Fig.1), but there are no reports about effectiveness of AST intervention for Orthopedic department. The purpose of this study was to investigate the implementation of microbiological examination and antimicrobial use from the outset of Orthopedic AST meetings.

METHODS: The subjects were 151 cases discussed in Orthopedic AST meetings from January 2020 to December 2021. There were 89 males and 62 females with a mean age of 70.9 ± 15.3 years who underwent antimicrobial therapy in our hospital. Evaluation items were the number of tissue culture submissions, the number of culture positives, and the usage of antimicrobials; We defined the period of January 2018 to December 2019 as pre-intervention and the period of January 2020 to December 2021 as post-intervention. Pre- and post-intervention comparisons were analyzed using the Student-T test at a significance level of p=0.05.

RESULTS SECTION: The major diseases included skin and soft tissue infections in 47 cases (31%), implant-related infections in 21 cases (14%), pyogenic spondylitis in 20 cases (13%), osteomyelitis in 13 cases (9%), and pyogenic arthritis in 10 cases (7%). Bacteria detected were *Staphylococcus aureus* 39% (*Methicillin-susceptible Staphylococcus aureus*: MSSA 31%, *Methicillin-resistant Staphylococcus aureus*: MRSA 8%), *Coagulase- negative Staphylococci* 15%, *Enterobacter* 6%,other Gram-positive bacteria 6%, *Escherichia coli* 4%, *Pseudomonas aeruginosa* 6%, other Gram-negative bacteria 13%, anaerobic bacteria 6%, fungi 2%.The number of culture submission significantly increased from 440±58 samples pre-intervention to 751±29 samples post-intervention (p=0.02), and the number of positive culture also significantly increased from 234±58 samples pre-intervention to 349±23 samples post-intervention (p=0.04). The culture-positivity rate was 53.2% before the intervention and 46.4% after the intervention(Fig.2). There was a significant difference in the usage of fourth generation cephalosporins between pre and post intervention(Table 1).

DISCUSSION: Direct AST intervention resulted in significantly increased the number of tissue culture submissions and culture positives. Since the culture-positivity rates before and after the intervention were both around 50%, we believe that the increase in the number of tissue culture submissions is an important factor in the identification of the initiating organisms. Early information sharing with the AST and prompt intervention by the AST may have contributed to the increase in the rate of culture implementation. The increase in the number of tissue culture submissions and culture positives contributed to the identification of *Pseudomonas aeruginosa* and *Enterobacter*, and promoted the appropriate use of antimicrobial agents.

SIGNIFICANCE/CLINICAL RELEVANCE: This paper is the first to report on the effectiveness of Orthopedic AST meetings in increasing the rate of microbiology testing, identification of flammatory organisms, and appropriate use of antimicrobial agents.

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IMAGES AND TABLES:

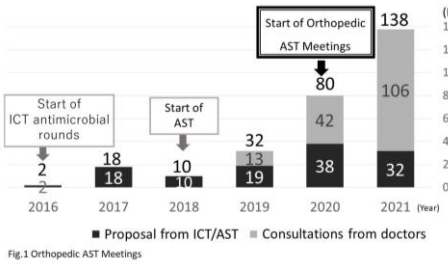

Fig.1 Orthopedic AST Meetings

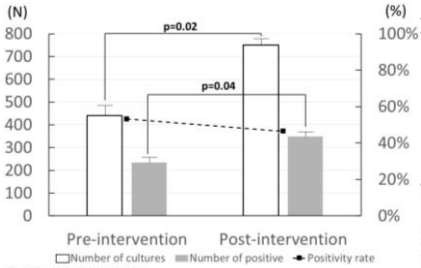

Fig.2 Microbiological examination

	Pre-intervention	Post-intervention	*p*-value
Total antimicrobials	180.9 (21.4)	251.5 (65.0)	0.281
Penicillins	44.3 (19.4)	69.6 (24.6)	0.371
1st-generation cephalosporins	92.3 (6.0)	100.3 (13.4)	0.521
2nd-generation cephalosporins	6.2 (3.4)	4.4 (1.1)	0.561
3rd-generation cephalosporins	8.7 (1.0)	9.9 (1.5)	0.461
4th-generation cephalosporins	0.1 (0.1)	2.7 (0.3)	0.011
Piperacillin/tazobactam	0.4 (0.4)	3.6 (1.6)	0.121
Carbapenems	2.2 (1.6)	5.5 (1.9)	0.201
Aminoglycosides	6.6 (1.1)	16.8 (11.2)	0.331
Anti-MRSA drugs	12.1 (0.5)	27.2 (6.7)	0.091
Other	8.0 (7.8)	11.4 (7.9)	0.711

Table 1. Comparison of Days of Therapy before and after AST Intervention
The numbers indicate the DOT with each antibiotic during pre and post intervention periods.
Each data shows the mean value and standard deviation.
MRSA: Methicillin-resistant *Staphylococcus aureus*
AST: Antimicrobial Stewardship Team
DOT: Days of Therapy