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Innovative Approaches to the Management of Surgical Site infection with Secretome from Placental Wharton Jelly Stem Cell (SC-PWJSC)

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Abstract **Case Report**

Surgical site infection is one of the postoperative complications that occur within 30 days after surgery. Surgical site infection is one of the causes of increased postoperative morbidity and mortality, with the probability of successful wound healing being less than 50% with conventional methods. One of the innovative methods of managing surgical site infections is using Secretome From Placental Wharton Jelly Stem Cell (SC-PWJSC). This report discusses the case of a 57-year-old man who experienced surgical site infection after a lower leg amputation. The patient was given treatment using Secretome From Placental Wharton Jelly Stem Cell (SC-PWJSC) by injection once on the first day, and topically used twice a day. During 28 days of treatment, the wound healing was perfect without any side effects resulting from this intervention.

Keywords: Secretome of placenta Wharton jelly mesenchymal stem cell (SC-PWJSC); Surgical Site Infection (SSI); mesenchymal stem cell; operation; amputation.

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1. INTRODUCTION

Surgical site infection (SSI) occurs within 30 days after surgery or within 12 months after implantation and transplantation [1]. Surgical site infection causes a very high increase in the burden of care costs and causes an increase in the incidence of postoperative morbidity and mortality [2, 3]. The incidence of Surgical Site Infection in America reaches 160,000 - 300,000 cases per year [4, 5] the incidence of surgical site infection in England and Vietnam were 15.7% and 10.9% respectively [6**]** and the incidence of Surgical Site Infection in Indonesia according to records from the Cipto Mangunkusumo Hospital (RSCM) reached 4.3% [7].

The World Health Organization (WHO), through the World Alliance for Patient Safety, reports that surgical site infections occur in 2% to 5% of the 27 million patients who undergo surgery each year and constitute 25% of the total infections that occur in health care facilities. The Center for Disease Control and Prevention (CDC) estimates that about 500,000 surgical site infections occur each year and contribute 3% to surgery-related deaths, long treatment lives, and increased costs of care. In the United States, the annual incidence of surgical site infection ranges from 2-5% despite advanced surgical techniques, advanced infection control, and the administration of prophylactic antibiotics perioperatively is universal. The rate of surgical site infection in Japan is about 15% of all nosocomial infections. According to WHO, the risk of surgical site infection in developing countries is more developed than in developed countries with the failure rate of surgical site infection treatment with conventional methods of more than 50% [8]. Based on the above explanation, it is known that surgical site infections that are not handled properly will have an impact on increasing the patient's mortality rate. Therefore we need a new treatment that can accelerate surgical site infections and reduce the mortality rate of surgical site infections. One of the latest innovations in the management of surgical site infections is the use of secretome from the Placenta Wharton Jelly Mesenchymal Stem Cell (SC-PWJSC). This treatment method is known to be very easy to implement even by ordinary people with good outcomes.

2. CASE REPORT

A 47-year-old man presented with a complaint of surgical wounds that continued to open and smelled after 27 days of amputation of his right lower leg due to diabetic ulcers. The patient current subjective complaint

is discomfort in the legs accompanied by pain, delayed chronic wound healing, discharge, and unpleasant odor from the wound (Figure 1).

Patients signed up the agreement to follow treatment using a single-dose intracutaneous injection of the secretome from Placental Wharton Jelly Stem Cell (SC-PWJSC) and control routinely for two weeks. Patients were also given secretome gel from Placental Wharton Jelly Stem Cell (SC-PWJSC) to be applied every day after the wound was cleaned with NaCl. Patients are also asked to note the symptoms of side effects that may arise from allergic reactions such as itching, redness, burning sensation, and swelling to seek first aid if severe side effects appear that are very disturbing.

The patient returned to control after 14 days of use, and it was found that the wound tissue had begun to close, and the infection had cleared with SC-PWJSC intervention. (Figure 2) with evidence that reepithelialization began to occur entirely on day 28 (Figures 3). Patients claimed to be satisfied with the intervention without any complications and side effects during the treatment period.

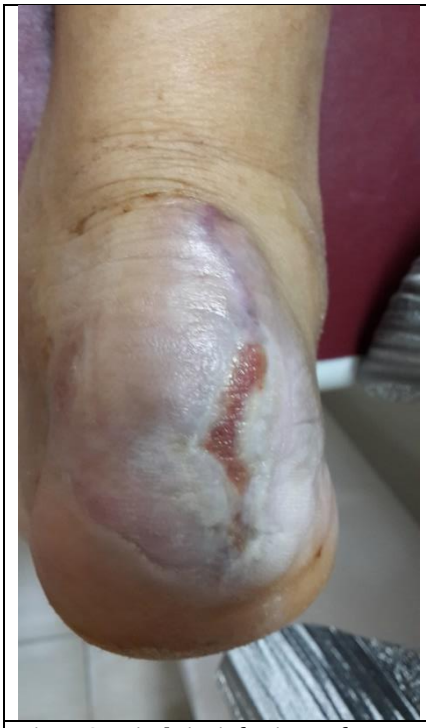

Fig-1: Surgical site infection Before Intervention

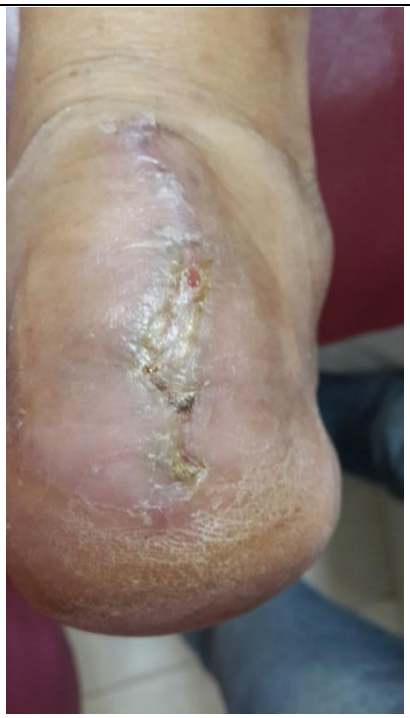

Fig-2: Post Intervention for 14 days

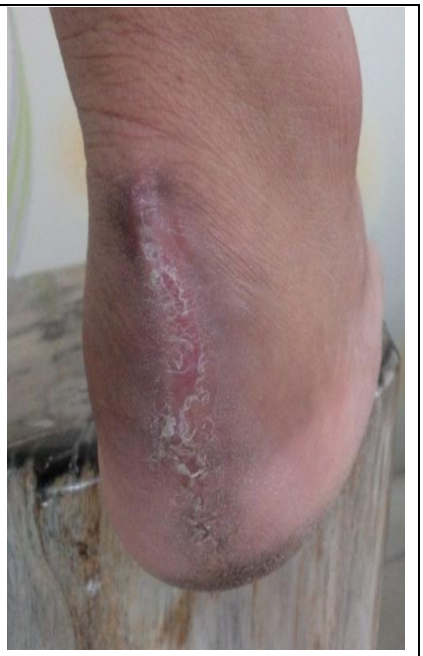

Fig-3: Post Intervention for 28 days

3. DISCUSSION

The first phase of wound healing is the inflammatory phase starting from the activation of the coagulation cascade in cytokines and chemokines that stimulate the movement of neutrophils, macrophages, and lymphocytes into the wound for wound cleansing mechanisms. Failure to control inflammation and prolongation of the inflammatory period results in the formation of scar tissue in the wound. Still, an inadequate inflammatory phase results in chronic wounds that do not heal for a long time, as is the case with surgical site infections [9].

The use of secretome derived from Placenta Wharton Jelly Mesenchymal Stem Cell (SC-PWJSC) will stimulate chemotaxis and growth factors such as insulin growth factor (IGF-1), platelet-derived growth factor (PDGF), interleukin 1β (IL-1β), interferon- γ (IFN-γ), IL-8, stromal cell-derived factor-1 (SDF-1), and tumor necrosis factor α (TNFα). MSC plays a role in regulating proinflammatory cytokines such as IFN-γ, TNFα, IL-1α, and IL-1β, which have an impact on suppressing T cell activity [10]. Other studies have also revealed that the use of MSC secretions plays a role in inhibiting the growth of infection-causing bacteria by secreting the human cathelicidin antimicrobial protein hCAP-18 / LL-37[11].

The next phase of wound healing is the proliferation phase, where the use of secretome derived from MSC functions as a wound healing mediator through paracrine signaling. The conditioned medium contains many growth factors, chemokines, and cytokines that act as proangiogenic factors (VEGF, angiopoietin-1, angiogenin, and leptin) [12]. The conditioned medium also contains various substances that promote the migration and proliferation of endothelial, epidermal, keratinocyte, and fibroblasts for wound reepithelialization in vivo through the formation

of ECM components such as collagen I mediated by the TGF-β / SMAD2 pathway [13].

The final phase of wound healing is the remodeling and maturation phase. The use of conditioned medium functions to increase the tensile strength of the wound, reduce the incidence of scarring, minimize wound contraction, and increase collagen expression [14]. The use of a conditioned medium plays a role in balancing the length of the inflammatory period. The prolongation of the inflammatory period causes wound fibrosis, and the use of MSCs leads to anti-inflammatory agents. The anti-fibrosis mechanism using MSC in this phase occurs through paracrine signaling from MSCs that secrete high doses of VEGF and HGF, which play a role in maintaining the ratio of TGF-β3 to TGF-β1. On the other hand, MSC also secretes bFGF and HGF, which play a role in dermis regeneration, VEGF, which reduces the incidence of scarring in wounds through mechanisms such as increased IL-10 production and inhibition of fibroblast proliferation and migration [15, 16].

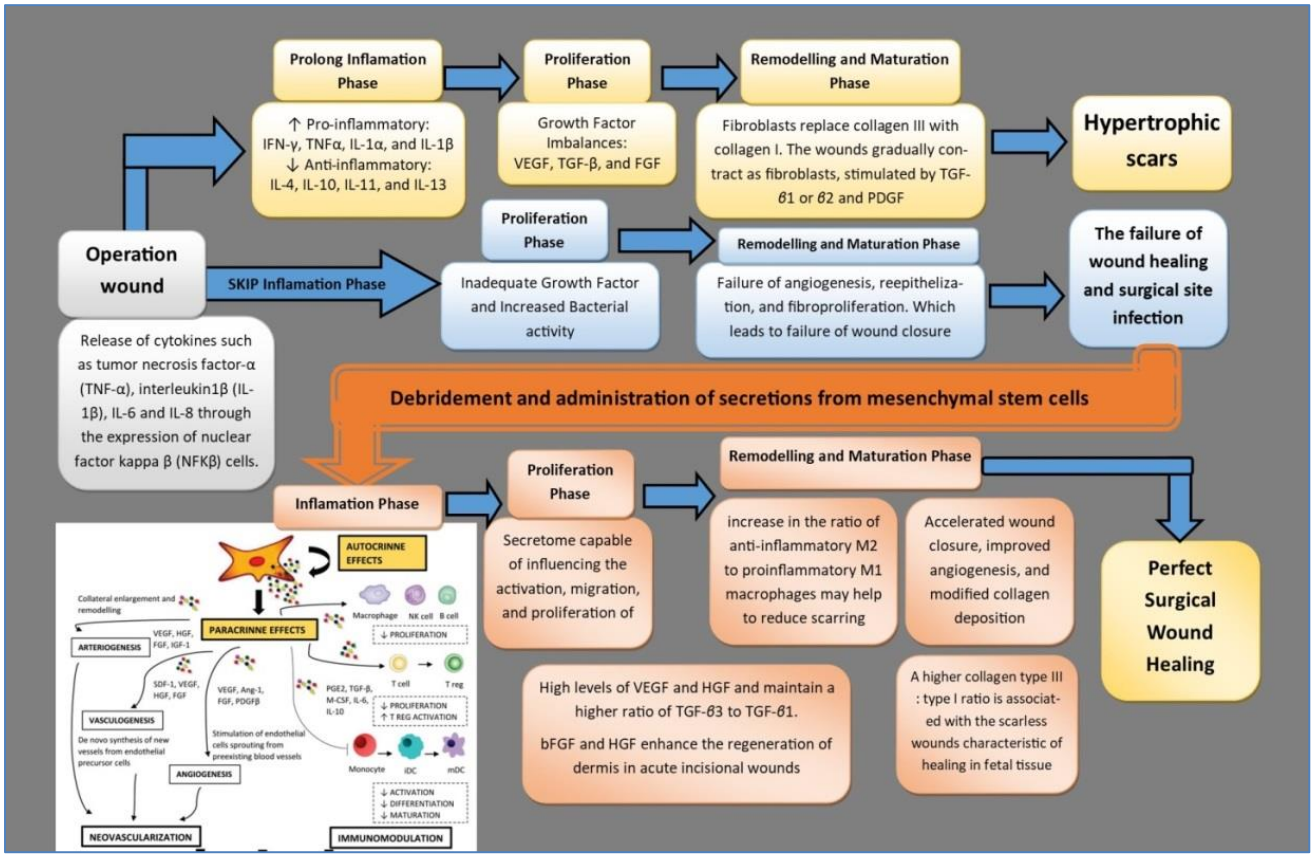

Fig-5: Wound Healing Mechanism in Surgical site infection with Secretome From Placental Wharton Jelly Stem Cell (SC-PWJSC) Intervention (Innovation Pathway with adjustments from Sukmawati Tansil Tan)

4. CONCLUSION

Surgical site infection is one of the postoperative complications that cause health financial burdens and increased postoperative morbidity. Surgical site infection is known to have a cure rate of less than 50% with conventional methods. A case of surgical site infection in a male 47 years after amputation of the right lower leg, which was given treatment using Secretome From Placental Wharton Jelly Stem Cell (SC-PWJSC) for 28 days. The outcome of the intervention showed excellent wound healing without any adverse events.

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