



Case report

Can L-PRF be helpful for delayed deep wound healing after a tracheotomy or lymph node dissection in a pN0 status?: A case report

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ABSTRACT

Introduction and importance: Leukocyte platelet-rich fibrin (L-PRF) is used for its ability to deliver high concentrations of autologous growth factors to host tissues, to promote tissue repair.

Case presentation: This report describes the case of a 48-year-old woman with tongue cancer treated surgically (pT3pN0), who experienced a delay of five weeks in the process of deep wound healing after a tracheotomy and cervical lymph node dissection that was treated with L-PRF. The patient had no risk factors for delayed wound healing, except for active preoperative smoking. Several attempts were made to stimulate bleeding and edge-to-edge closure, without conclusive results. However, five days after L-PRF placement, the subcutaneous tissues were adhering to the deep planes in both wounds. Fifteen days after L-PRF treatment, a complete wound healing was observed which allowed initiation of postoperative radiotherapy.

Clinical discussion: This case report questions the potential of L-PRF for patients with a pN0 status, not only in superficial wounds, but also in deep wound healing. However, the use of L-PRF for patients with a pN1 status is not recommended, given the possible presence of tumour cells in the tissues, and the activation of these tumour cells by the growth factors present in L-PRF.

Conclusion: This report supports the idea that L-PRF can contribute to deep soft tissue healing for patients with a pN0 status due to its positive clinical healing effects.

1. Introduction

Wound healing involves a dynamic process with various cell types and soluble mediators influencing the homing of circulating cells to damaged tissues [1]. This process can be divided into four distinct but overlapping stages: haemostasis, inflammation, proliferation, and remodelling [2,3].

During the process of wound healing, platelets have been found to be important cells regulating the haemostasis phase through vascular obliteration and by facilitating fibrin clot formation [1]. However, in pathologic conditions such as non-healing wounds, this healing cascade is lost, and the wounds enter a state of chronic inflammation characterized by neutrophil infiltration, reactive oxygen species, and destructive enzymes [2]. Accordingly, leukocyte platelet-rich fibrin (L-PRF) is a refined platelet concentrate that secretes high levels of bioactive substances that slowly diffuse to the surrounding micro-environment which facilitates tissue regeneration [4,5]. L-PRF has been shown to be

beneficial in surgical wound healing for both superficial soft tissues and hard tissues. However, the beneficial properties of L-PRF in deep wound healing are rarely described. Hence, this presented case focuses on L-PRF treatment for delayed deep wound healing.

There is a great disparity in the definition of ‘chronic wounds’ in literature. Some authors define a chronic wound as a barrier defect that has not healed in three months, while others define it as a wound lacking a 20–40 % reduction in size after two to four weeks of optimal treatment or when there is no complete healing after six weeks [6,7]. The described case has been considered as an instance of delayed wound healing because there was still no clinical wound healing visible five weeks after surgery, and the wound borders remained atonic. This case report has been reported in line with the SCARE criteria [8].

2. Case presentation

A 48-year-old Belgian woman presented with a squamous cell

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Fig. 1. Nine days after surgery, the patient showed a cervical abscess.

carcinoma of the right-sided tongue. The lesion appeared in the last six weeks and had the following clinical dimensions: 2.5 cm diameter in the posterior third of the tongue. There was also an adenopathy present in the right sector (level IIa). Additional MRI, PET-CT, pharyngoscopy and naso-pharyngo-laryngo fibroscopy for biopsy were realized and revealed no other lesions.

One week after the oncologic work-up, the patient was treated with partial glossectomy, modified (level I-IV) cervical lymph node dissection (cervicotomy incision), tracheotomy, and reconstructed with a radial free flap. The operation time was around 10 h, with no direct complications. Two cervical drains were placed at the end of the surgery which were removed after two days. The definitive staging of the tumour was pT3pN0 with clear tumour margins. After multidisciplinary work-up, postoperative radiotherapy on the tumour site was decided. The entire hospital stay was 28 days. Seven days after surgery, the tracheostomy tube was removed. Nine days after surgery, the patient developed a cervical abscess (Fig. 1) which was drained, rinsed with povidone, filled with AquaCell®, and superposed by a compression bandage. Wound management was performed once daily. By the end of the first week, the cervical wound was clean, but the wound borders remained atonic with exposure of the sternocleidomastoid muscle, without adhesion from the cutaneous plan to the deep plan (Fig. 2). There was no exposure of the jugulocarotid axis. Furthermore, the tracheotomy sutures showed dehiscence but without any signs of infection. Three weeks after the surgery, both wounds were dry and atonic without salivary discharge or stasis. No communication between both cervical and tracheotomy sites was found. A nasogastric tube was placed to protect the cervical site even though there was no salivary flow from the oral cavity. The radial flap presented good perfusion. The patient did not have any history of

hypoproteinaemia or other risk factors for delayed healing (no diabetes, no renal failure; vitamin A and C, prealbumin, and TSH levels were normal, as was the level of haemoglobin). Her BMI was normal during the entire stay, she had no vascular pathology (no arterial hypertension, no arteritis, and no venous insufficiency) nor congenital connective tissue disease, and she had never undergone surgery before. Only active preoperative smoking of 29 pack-years was reported.

Several attempts such as three curettages, edge-to-edge closure, and slicing were performed in one week to stimulate bleeding by a maxillofacial surgeon with 30 years of experience in head and neck oncology, and a junior trainee with 2 years of surgical experience. A month after the operation, the wound remained atonic as shown in Fig. 3. Before choosing a more invasive treatment such as surgical revision under general anaesthesia, and given the patient's pN0 status, a local filling with L-PRF clots and a Sofsilik™ sutures was tried by a maxillofacial surgeon with 30 years of experience initially.

L-PRF was used in a solid type from dens fibrin, derived from the original form of PRF using high centrifugal force in plastic tubes to separate the plasma from the red blood cells within 2800 turns per 10 min. Two clots of L-PRF were placed at the tracheotomy site and six clots at the cervicotomy site, after curettage of the two areas to induce bleeding. Clots instead of membranes were used to maintain volume. Five days after the L-PRF filling (Fig. 4), the subcutaneous tissues were clinically adhering to the deep planes in both wounds. After a close observation of fifteen days, complete wound healing was observed allowing the initiation of postoperative radiotherapy (Fig. 5). The patient was very relieved and satisfied with the result. Postoperative radiotherapy was uneventful, without complications, and the follow-up eighteen months after radiotherapy treatment was normal and without



Fig. 2. Three weeks after surgery, the cervical wound was clean but atonic, with exposure of the underlying sternocleidomastoid muscle.

oncological recurrence.

3. Discussion

This case report illustrates the efficacy of L-PRF in deep wound healing. Generally, classical procedures to close a wound include the use of vacuum-assisted closure (VAC) or reopening and cleaning the site by approximation of the wound edges. In this case, the use of VAC was not indicated because of the proximity of the carotid artery and jugular vein. Furthermore, curettage and compression were not effective in this patient's wound healing. Therefore, L-PRF was used. L-PRF is an autologous platelet concentrate, capable of increasing the proliferation of cells involved in tissue repair and stimulating angiogenesis. It releases growth factors into its microenvironment (platelet-derived growth factor-AA [PDGF-AA], PDGF-AB, PDGF-BB, transforming growth factor beta [TGF- β], vascular endothelial growth factor [VEGF] and insulin-like growth factor [ILGF]), and possesses anti-inflammatory and antimicrobial properties [1]. Therefore, L-PRF is frequently used to enhance wound healing and tissue regeneration [9]. L-PRF does not dissolve directly but remains in situ for seven days after application [10]. Subsequently, the purpose of this case presentation was to illustrate the use of L-PRF in deep wound healing in a patient with a pN0 status. The pN0 status is important to avoid giving any growth factors to possible residual tumour cells. This is why the pathological result was waited for before using L-PRF in the reported case.

According to literature, L-PRF is mostly used for regenerative procedures in superficial skin tissue, but the use in deep tissue is rarely described, and only a few cases have been reported [11–13]. One study showed the use of L-PRF membranes in the parapharyngeal area after

total laryngectomy, to improve healing and to decrease the incidence of postoperative pharyngocutaneous fistulas [11]. The beneficial effect of L-PRF in the healing process can be explained by the high concentration of platelets and leukocytes, together with the long-term release of growth factors [10,14]. Furthermore, the fibrin matrix enhances the delivery of growth factors over the wound area, as a result of which L-PRF is able to slowly release growth factors and stimulate its environment for a certain time during the wound-healing process [15].

Wound healing can be delayed by several factors including patient-related factors, tumour-related factors, and treatment-related factors. Patient-related factors include age, gender, smoking, alcohol consumption, duration of hospital stay, comorbidities, decreased preoperative haemoglobin, albumin and calcium levels, previous radiotherapy or chemoradiotherapy, hypotension, etc. [4,11,16]. Tumour-related factors include the stage of the tumour, whereas treatment-related factors include margin status, type and technique of closure, preoperative tracheotomy, wound infection, etc.

In literature, chronic wounds appear to have compromised keratinocyte and fibroblast migration, lack of angiogenesis, and excessive deposition of extracellular matrix proteins. Because fibroblasts within chronic wounds have been shown inactivated, it is important to induce the activation of these fibroblasts for the initiation of the wound-healing process [15]. The proliferation of fibroblasts itself is precisely regulated by cell cycle regulatory proteins (G1 cyclins and their kinases). Since platelet-rich plasma treatment induces an increase in expression of these cell cycle regulators, and treatment with L-PRF progressively releases a significant amount of growth factors, it has the potential to accelerate the wound-healing process [10,15].

Delayed wound healing after head and neck surgery can prolong



Fig. 3. One month after surgery the wound remained atonic.



Fig. 4. Five days after L-PRF filling, the subcutaneous tissues were clinically adhering to the deep planes in both wounds.

hospital stay and increase postoperative morbidity. In addition, it may delay the start of adjuvant radio(chemo)therapy treatment. Therefore, it is important to address this postsurgical complication and support ongoing research to prevent complications. Accordingly, this case report adds to the growing body of research on the use of L-PRF in wound healing, showing its ability in superficial wound healing and its potential in deep wound healing. Moreover, this technique is not only clinically beneficial, but also easy to use and cost-effective.

4. Conclusion

The multidisciplinary use of L-PRF in tissue regeneration has grown over the last years and has been used in various medical fields such as oral and maxillofacial surgery, dentistry, reconstructive surgery, plastic surgery, and dermatology [1]. This report demonstrates that L-PRF can be an indication for patients with a pN0 status for deep soft tissue healing. However, the use of L-PRF in a pN1 status is not recommended, given the possible activation of tumour cells by growth factors present in L-PRF.

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Ethical approval

Not applicable.

Patient informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Éléonore Fourneau (Conceptualization; Data collection; Investigation; Writing – Original draft; Writing - Review & editing), Michèle Magremanne (Conceptualization; Investigation; Writing - Review & editing), Kathia Dubron (Conceptualization; Investigation; Writing – Original draft; Writing - Review & editing).

Research registration

Since this case report does not contain any new surgical technique or equipment, it has no Research Registry UIN.

Guarantor

Michèle Magremanne accepts full responsibility for the work and approves the whole process from designing the study to publication.

Provenance and peer review

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Fig. 5. Complete wound healing eighteen months after surgery.

Declaration of competing interest

The authors declare there are no conflicts of interest.

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