

Tissue Perfusion and Oxygenation in Daily clinical Life

Finn Gottrup MD, DMSci

Professor of Surgery

Copenhagen Wound Healing Center, Department of Dermatology,
Bispebjerg University Hospital, DK-2400 Copenhagen NV, Denmark

Introduction: It is a fundamental clinical observation that wounds do not heal in tissue that does not bleed and almost always heal in tissue bleeding extensively. This is based on hypoxia introduced by the tissue injury. Tissue has no oxygen store, and tissue oxygenation becomes a function of the capacity of the lungs, the cardiovascular system and the oxygen diffusion in the tissue.

Measurement of Tissue Oxygen can be accomplished by subjective clinical or objective laboratory methods. Subjective clinical perfusion can be evaluated by inspection, pulse in superficial arteries, capillary pulse, temperature, sensitivity. Objective laboratory tests can measure the perfusion by different methods like scanning systems, strain gauge methods, and P_tO_2 measurements transcutaneously, subcutaneously or using a pulse oximetry. Directly measured P_tO_2 by introducing a small oxygen sensor in the subcutaneous tissue is the optimal place for monitoring of general tissue perfusion. Measurement of the blood saturation (pulseoximetry) is routinely used. This method shows primarily the oxygen conditions in the blood and has only value as a monitoring system in situations where all influencing factors of P_tO_2 are functioning optimally.

Influencing Factors. In subcutaneous tissue the tissue perfusion and oxygenation is dependable of many local as well as systemic factors. Locally oedema and systemically smoking will be focused on.

Oxygen in clinical practice: Two applications forms have been used: *Topical/Local application* of oxygen on the wound surface has been used to increase regeneration of epithelium. Topical applied oxygen does not diffusing into deeper tissues, but may have advantageous potential to oxygenation of the superficial areas of the wound. *Systemic application* of oxygen through the lung and cardiovascular system is known to improve wound healing and decrease the risk for infection. Supplementary oxygen administrated to the breathing air the first two postoperative hours has decreased the postoperative wound infection rate in colorectal surgical patients, while it has not yet been tested in other types of acute wound patients.

Conclusion: Oxygen is vital for the healing of wounds and avoidance of postoperative infection. Supplementary systemic oxygen has been shown to decrease the infection rate after colorectal surgery. Although definitive proof of the effect oxygen therapy in clinical wound healing is established, the circumstances of its use are still debated.