SMOKING AND ORTHOPAEDIC SURGERY

The use of tobacco is a significant contributor to
- cardiovascular diseases: heart attack, angor
- oral, urinary and pulmonary neoplasms
- chronict respiratory diseases
- peripheral vascular arteritis

Many studies have been reported for many years related to detrimental effects of tobacco to various orthopaedic problems (21-35)such as delayed fracture repair (6-9), delayed healing in ltibial lengthening (14), risk of non-union (1-8), decreased bone density (12-19-25) .

BIOLOGICAL EXPLAINATIONS

There is some evidence that smoking accelerates the ageing processes, not only in the cardiovascular and pulmonary systems, but also in the musculoskeletal system (21-35): bone, tendon, joint. .
Direct damage to red blood cell precursors, macrophages, and fibroblasts (46), and the vasoconstrictive and thrombogenic effects of nicotine have been implicated as possible etiologic factors.
Collagen production is an important factor in wound repair and has been found to be dcreased in smokers (18-21).

Carbon monoxide reduces tissue oxygenation and impairs the microcirculation within healing soft tissue and bone. Nicotine is also a potent vasoconstrictor and impairs the revascularisation of healing bone leading to impaired bone and wound healing (10 -28 -37).
Hypercoagulabilty observed in smockers may be explain by an increase of hematocrit value, red cell volume, and high plasma fibrinogen levels.
It has also been demonstrated that smoking has an effect on the immune system (5).

All of this leads to a decreased blood delivery to tissues (18).

JOINT REPLACEMENT

In many articles published in the orthopaedic litterature, smoking is **the single most important risk factor** for the development of serious postoperative complications in patients undergoing elective hip and knee arthroplasty (22-24-29-30-31-33).

This is true whether we consider all general complications as cardiopulmonary complications but also specific complications of surgery : wound healing because of

bad vascularisation, the risks of further surgery, and the need for admission to Intensive Care Unit after surgery.
This is particularly true when co-morbidity as diabetes is present.

Previous and current smokers have a 43% and 53% increased risk of systemic complications, respectively, compared with non smokers. In heavy smokers, the risk increases to 121% (2).

The risk for patient with a high Body Mass Index (> 30) may increase to 58%.

The current smokers who undergo joint replacement consume more health ressources and have longer surgical and anesthesia times (24).

BONE HEALING

Spine surgeons have reported 3 to 4 times higher non union or delayed union after bony fusions because of delayed revascularisation within the graft, and predisposition to graft necrosis (11-12-45). Others found 50% delay in healing of open or closed tibial fractures in smockers.

Experimental works showed that the callus of smoking groups is mainly composed of woven bone instead of lamellar bone, leading to a decrease of the mechanical strength at 8 weeks.

Smoking adversely affects both primary fracture healing (1-16), impaired wound healing , delayed bony union, and non-union treatment, because of bad oxygenation of injured tissues (15-28) as well as having an adverse effect on the immune system.

Smokers are more likely to require further surgery, which may be related not only to impaired wound healing and infection, but to impaired healing of bone, which has also been recorded in dental and spinal surgery.

TENDON AND LIGAMENTS

Nicotine is responsible of a delayed tendon-to-bone healing in experimental animal models. Chronic inflammation and decreased cell proliferation may partly explain the inferior biomechanical properties in the smockers group as compared with the nonsmoking group.
The same has been reported whenusing hamstring grafts (DIDT) (40).

People who smoke have a worse functional outcome following primary reconstruction of the ACL. Symptoms of instability and laxity have been reported by patients subjectively and objectively with side-to-side differences in ACL reconstruction.

Following reconstruction of the ACL some analysis (20) demonstrated in the smokers groups:
- a significantly increased frequency and intensity of pain , a decreased level of activity before the onset of pain, an increased incidence of locking and catching of the knee and subjective instability .
- a higher proportion of patients unable to return to their original level of sport
- a mean difference in side-to-side laxity of 2.2 mm (0 to 12) in smokersgroup, compared with 1.4 mm (0 to 14) in nonsmokers group.

HEALTH-CARE ECONOMIC CONSEQUENCES

Occurrence of postoperative complications means that:
- it will affects surgical results
- an extended stay in hospital
- a treatment in ICU
- a prolonged antibiotic therapy
- a secondary surgery.

This is quite important for health-care economics as all are expensive.

ARE REVERSIBLE EFFECTS POSSIBLE ?

Nevertheless, many of the adverse effects of smoking are reversible (30-31). It seems that it is possible to reduce the incidence of postoperative complications by persuading patients **to stop smoking some time before surgery**.

Cessation prior to surgery and during the period of rehabilitation has been proved to significantly reduce post-operative complications and improve the chance of success.

The time to reach physiologic baseline after smoking cessation has been reported to range from **six to eight weeks.** It needs at least 6 weeks to normalise biological blood values and to decrease the risk of short term complications (31-32-34-45).

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