SSI update: Preoperative risk factors and possibilities for prevention

Publication

Lohmann und Rauscher GmbH & Co. KG

At a glance

- **In 2016, nearly 59 million operations and medical procedures were conducted in German hospitals.[1]**
- **According to a representative analysis[2], surgical site infections (SSI) accounted for 22.4% of nosocomial infections, exceeded only by lower respiratory infections.**

Considerable attention should be given to the prevention of SSI, as they can be associated with a 2 to 11-fold increase in a patient's mortality rate. With the appropriate pre-, intra- and postoperative measures, however, up to 60% of all SSI can be prevented.[3] There are numerous pre-existing factors that can be addressed and influenced before planned procedures, such as anaemia, malnutrition, high alcohol consumption, immunosuppression or even pre-existing infections. Diabetes mellitus, obesity and nicotine abuse are among the most common factors for which there are numerous, conclusive studies on the potential risks and potential for prevention.[4]

Diabetes mellitus

A meta-analysis of over 94 studies[5] examined the risk of SSI in patients with and without diabetes mellitus. In total, more than 850,000 procedures were analysed. On average, 17% of the patients had a pre-existing diabetes condition. The results indicate that diabetes mellitus patients generally had a 53% higher risk of SSI compared to non-diabetic patients. In particular, an elevated pre- and intraoperative glucose level increased the risk by 88%.

A comprehensive retrospective cohort study (n = 13,800 patients)[6] found an increased risk of SSI in patients with increased preoperative HbA1c levels. Moreover, a correlation was identified between the variability of the pre- and postoperative glucose levels and the occurrence of SSI: a 10% increase in the coefficient of variation of the glucose level correlated to an 11% increase in the risk of SSI.

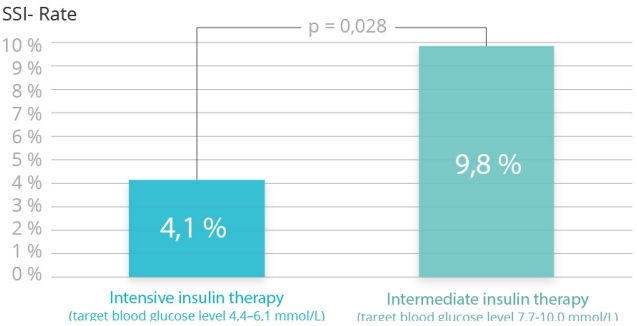
Focus on HbA1c level

The HbA1c level and its correlation to SSI was one of the main criteria for a retrospective study of diabetic patients who underwent a surgical intervention[7]. 35% of patients with a HbA1c level above 7.0% developed postoperative SSI, in contrast with zero patients from the control group with a HbA1c level below 7% (p = 0.006).

A retrospective observational study on a group of orthopaedic patients[8] corroborated the relevance of the preoperative HbA1c levels. 17.5% of patients with HbA1c < 7% developed an SSI after surgery, compared to 32% of patients with HbA1c > 7% (p < 0.01).

A prospective clinical study of 447 patients[9] who needed to undergo an elective surgical procedure examined the extent to which perioperative optimisation of blood glucose concentrations had an impact on the frequency of SSI. Half of the patients were randomly assigned to either an intensive insulin therapy group (target blood glucose level 4.4 – 6.1 mmol/L) or an intermediate insulin therapy group.

SSI rate as a function of target glucose level



Results: Patients from the intensive insulin therapy group (IIT) who achieved their target blood glucose levels had a significantly lower SSI rate compared to the patients with less strictly-controlled blood glucose levels (4.1% vs. 9.8%, p = 0.028).

Recommendation for diabetes:

- **Reduce HbA1c levels preoperatively to below 7%**
- **Avoid hypo- and hyperglycaemia**
- **Aim for a target glucose level of 4,4-6,1 mmol/L with the aid of IIT**

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Obesity

Body mass index (BMI) is an essential factor in risk stratification with regard to the development of an SSI. A national database with over 380,000 surgical patients[10] was analysed and it was found that there was a continuously increased risk of SSI with increasing BMI. The scale of the risk increase was also dependent on the type of operation. With a 6.5-fold increased risk, the greatest increase in risk was for obese patients with a BMI over 40 who were undergoing a hip replacement. For the same procedure, there was "only" a 3-fold increase in risk for patients with a BMI between 30 and 40.

The immediate conclusion to be drawn that preoperative weight reduction can reduce the risk of SSI is, however, only partly true. A comprehensive review[11] of this topic found that losing too much weight too rapidly preoperatively can even increase the risk of SSI.

A recent randomised study[12] has shown that the use of negative-pressure wound therapy (e.g. CNP P3) can reduce the risk of SSI after an elective or emergency Caesarian section for women with a BMI > 30.

Recommendation for obesity:

- No uncontrolled, rapid weight reduction
- If necessary, postpone appointment for surgery

Nicotine abuse

Nicotine weakens immune function and affects the supply of oxygen to the tissues, such that the impact of nicotine consumption on postoperative wound healing is quite unsurprising.[13]

A meta-analysis[14] examined the occurrence of SSI among smokers vs. non-smokers after surgical procedures. The findings show an 80% increased risk of SSI among active smokers. The same study shows that preoperative smoking cessation (4 – 8 weeks before surgery) can more than half the risk of SSI (odds ratio 0.43).

Interestingly, an observational study[15] has shown that even short-term cessation of nicotine intake on the day of the operation can reduce the risk of SSI: compared to the patients who stopped smoking, the risk for patients who smoked up to the surgery was almost double.

Recommendation for nicotine abuse:

- Quitting smoking at least 4 weeks before the surgery is recommended
- If it is no longer possible to abstain from smoking for 4 weeks, the patient should at least not smoke on the day of the surgery as well as after surgery

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