Temperature, air humidity and mixing technique are external influences on the time window available for working

The time in which the bone cement polymerises is dependent not only on the selected viscosity variant but also on external influences on the mixing environment. Three factors determine the time until the final setting of the bone cement: temperature, air humidity and mixing technique. They extend or shorten either the waiting, working or setting phases. The key phase for the surgical team is the working phase, that is, the time in which the bone cement can be applied.

Temperature

Temperature has the biggest influence on the working time. PMMA bone cement is temperature sensitive. The effect of cold slows down polymerisation and reduces the initial viscosity, thus extending the working time. In contrast, heat accelerates the polymerisation – the initial viscosity is increased and the working time is shortened.

The speed of the polymerisation is affected by:

- the temperature of the cement components themselves (e.g. if the package is pre-chilled in the refrigerator)
- the temperature of the mixing device, the prosthesis but also of the table and hands
- the room temperature in the operating theatre (e.g. due to air conditioning)

If the bone cement is stored at 23 °C, for example, the setting phase usually starts after 6–7 minutes and the surgeon has a relative short time window available for working. For a bone cement pre-chilled in the refrigerator at 4 °C–7 °C on the other hand, the time window increases to about 12–14 minutes. Depending on the type of surgery, requirements and the experience of the surgeon, it may be useful to chill the bone cement before use.

Storage conditions for bone cement

Cement powder and monomer liquid must not be stored at temperatures above 25 °C. If favoured, bone cement can be pre-chilled at 4–7°C for a minimum of 24 hours. It is recommended to remove the bone cement components from the fridge just prior to the mixing.

Air humidity

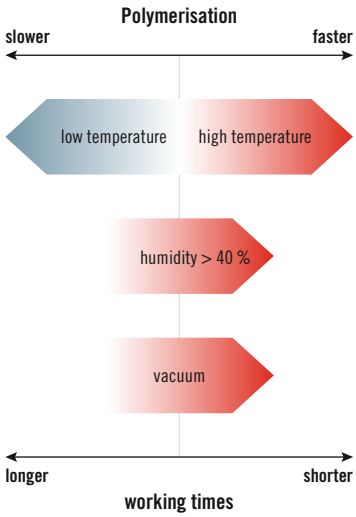
The relative humidity must also be taken into account. If it is above 40 %, the working phase shortens by 1–3 minutes. In some operating theatres without or with only weak dehumidifiers, the air humidity increases, e.g. with certain weather conditions or after previous arthroscopy.

Do not open the pouch too soon

The aluminium pouch protects the bone cement powder from air humidity that is too high and it should therefore be opened just before mixing.

Mixing technique

During mixing there is always a transfer of energy to the bone cement: The higher the energy input (faster movements, greater force application), the faster the polymerisation. By using a vacuum mixing system, the working times shorten compared to mixing the bone cement by hand, for example. In practice, this acceleration can be balanced out by using a pre-chilled bone cement.



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