Early mobilisation with a bed bicycle: focus on intensive care

The goal for patients in acute care is rapid restoration of independent mobility and weaning from mechanical ventilation.

Studies [15] suggest that the consequences of insufficient early mobilisation cannot easily be rectified in further rehabilitation [14]. As a result, the proportion of functionally independent patients at discharge remains lower [14], resulting in high follow-up costs.

Thus, for patients for whom there are no exclusion criteria, mobilisation should be started within the first 72 hours – as recommended by the guideline of the German Society for Anaesthesiology and Intensive Care Medicine [1].

Therapy should be performed twice daily for at least 20 minutes. Mobilisation is divided into three stages: passive, active-assisted and active. The guideline recommends the use of a bed bicycle for all stages of mobilisation [1]. Early mobilisation also plays a decisive role in weaning from the respirator. Accordingly, intensive physiotherapy is recommended in the guideline "Prolongiertes Weaning" [Prolonged Weaning] from the German Respiratory Society [13]. Passive to active equipment-supported movement training of the arm and leg muscles – adapted to the patient's capability – is recommended. The bed bicycle is thus a component in the overall early mobilisation and weaning concept. Especially when patients are not yet able to cooperate at will, there is an increased demand for assistive technologies to support them [11]. The bed bicycle has proven to be an effective aid [1,2,7,11,13,16].

It is apparent that in the long term, early rehabilitation is beneficial not only for the patient, but also for the health system.

Early mobilisation shortens the length of stay [9,12], the weaning time from the respirator [14] and lays the foundations for independent living [14]. This contributes to reduced treatment costs [3,4,8].

In addition to the general benefit of early mobilisation, studies have confirmed the effectiveness of the bed bicycle.

Burtin et al. [2] compared standard mobilisation with standard mobilisation plus 20 minutes of bed bicycle training. Once patients were able to pedal actively, the 20 minutes were divided into 2x10 min of active pedalling. On discharge from hospital, the 6-minute walking test showed a clear difference in walking distance. While the control group walked an average of 143 metres, the intervention group walked an average of 196 metres – an increase in walking distance of 37%. Independent walking was possible for 73% vs. 55% of patients. It also became apparent that the functional strength gain for the thigh extensors increased significantly through passive use.

The work of Machado [7] was able to underline that through passive use, i.e. when the patient is not yet able to support the pedalling action, a significant increase in muscle power (MRC score) can be achieved. The strength tests took place on the day of discharge (post-implementation) and on the first day (pre-implementation) that the patient could be awoken. Especially in the early phase, when patients are not yet able to initiate movements themselves, it has been shown that a bed bicycle is an effective training method.

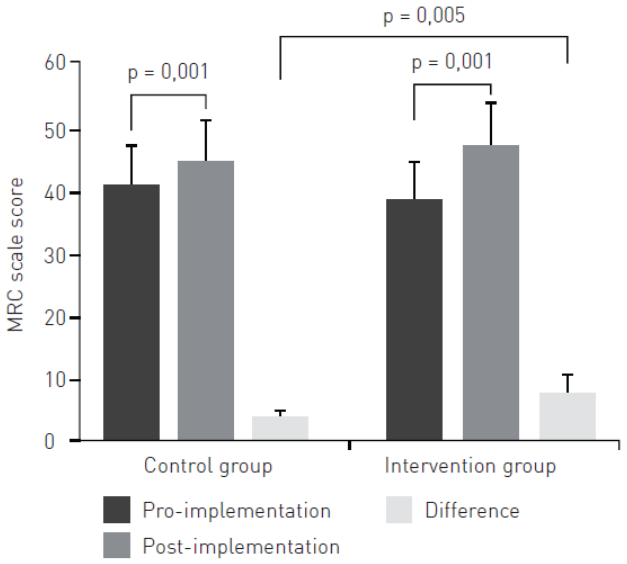

Figure 1: Peripheral muscle strength, as measured by the Medical Research Council (MRC) scale, before and after the implementation of the study protocol. Student's t-test.

The issue of application safety [5] is also supported by evidence. Only one safety-relevant event occurred in 541 uses of a bed bicycle.

Parry's research group [11] combined the use of the bed bicycle with functional electrical stimulation (FES) of the large muscle groups in the leg area. The focus here was primarily on the feasibility and safety of this approach, both of which were confirmed.

Secondarily, there was a trend towards earlier and faster ambulation for patients and a lower incidence of delirium.

The duration of delirium was significantly reduced. Delirium is one of the most common acute organ dysfunctions during intensive care treatment. It is a neuro-psychiatric syndrome involving states of confusion, which affects 80% of ventilated and 50% of non-ventilated patients [6]. Studies show that with each day of delirium the one-year probability of survival decreases by 10%, the length of stay in the hospital increases and patients become dependent on care more often and at an earlier stage [10].

Tenório de França [16] studied the effects of passive use of the bed bicycle on oxidative stress and nitric oxide levels in the blood. These are both thought to be partly responsible for the ageing process and reduced life expectancy. The result was that these factors are positively influenced and thus have a beneficial effect on the organism.

Bed bicycle – evidence-based effects of early mobilisation at a glance:

1. Walking distance increases
2. Independent walking more often becomes possible again during the course of treatment
3. Strength increases faster in the course of treatment
4. Oxidative stress and duration of delirium are reduced
5. Low risk associated with use

In summary, it is clear that the use of a bed bicycle is effective as part of early mobilisation and weaning. It is therefore an integral part of treatment recommendations [1,13]. The ability to walk is a frequent and high-priority goal for patients. It is in this area in particular that the use of the bed bicycle shows its strength. In the context of early mobilisation in intensive care units, it has proven to be attractive in many different respects. Especially in times when personnel resources are scarce, it is an option for a supplementary, second mobilisation that complies with the guidelines. Successful early mobilisation is an important building block for patients to return to an independent and self-determined life [10,14]. A favourable cost-benefit ratio for clinics can also be demonstrated. The shortened length of stay in intensive care units and hospitals [9], as well as the reduction of complications such as delirium associated with successful early mobilisation has not just an immediate positive effect, but the burden on the healthcare system is also relieved over time through reduced therapy and care costs [3].

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