GLUCOCORTICOID-INDUCED IMPAIRMENTS IN ACTIVITIES OF DAILY LIVING IN PEDIATRIC ACUTE LYMPHOBLASTIC LEUKEMIA AND NON-HODGKIN LYMPHOMA

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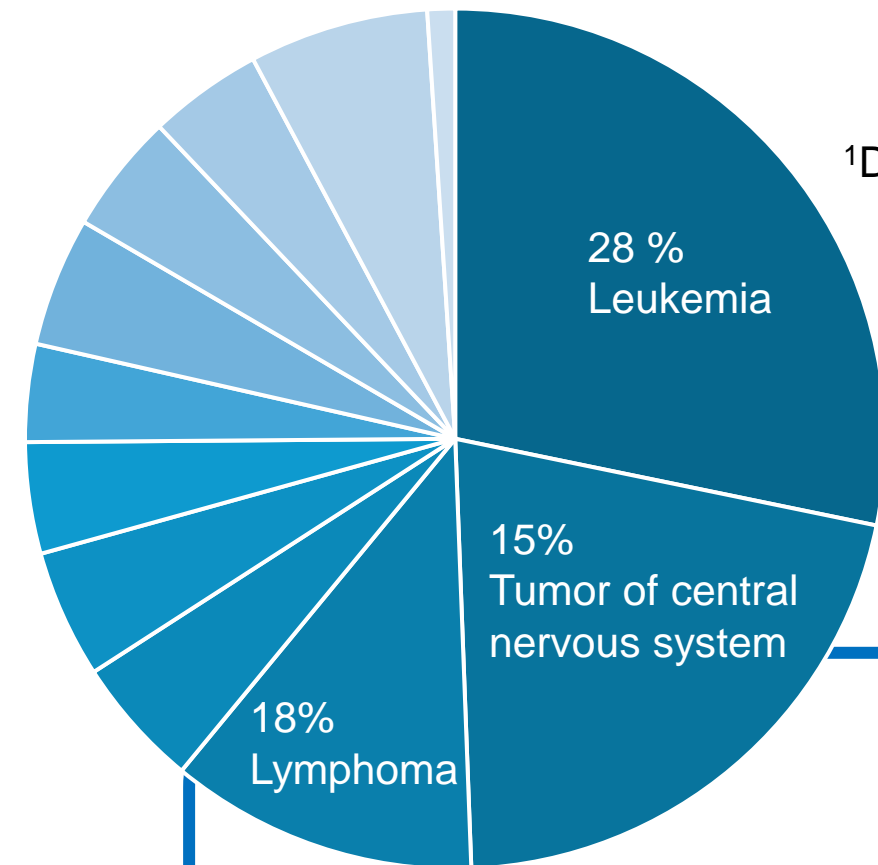
Figure 1: Types of cancer in children and adolescents aged 0-19 years[1].

Pie chart labels: 28% Leukemia, 15% Tumor of central nervous system, 18% Lymphoma

Introduction

Acute lymphoblastic leukemia (ALL) and Non-Hodgkin lymphoma (NHL), belonging to the most common types of cancer in children an adolescents (Fig.1), are treated with chemotherapy combined with glucocorticoids. However, their associated short-term toxicities including physical side effects can have enormous effects on patient´s autonomy and quality of life, considering high survival rates up to 80%[2]. Glucocorticoid-induced restrictions in the performance of activities of daily living (ADL) need to be identified to be counteracted efficiently, also with non-pharmacological interventions like exercise therapy.

Methods

- ActiveADL study[3,4] : 37 patients with ALL and NHL received exercise interventions 2-3 times per week. At four visits (T0-T3), we assessed the ADL accomplishment (primary outcome) using the self-reported Activities Scale for Kids© (ASK)[5].
- We gathered various cumulative glucocorticoid doses and glucocorticoid-free duration prior to each visit to explore effects caused by glucocorticoids.
- To analyze the impact of glucocorticoids on the outcome, we used a linear mixed model. By including fixed effects (gender, treatment protocol, study group and study center) and especially random effects (age, number of inhospital stays, duration of exercise interventions), we could control for potential confounding factors.

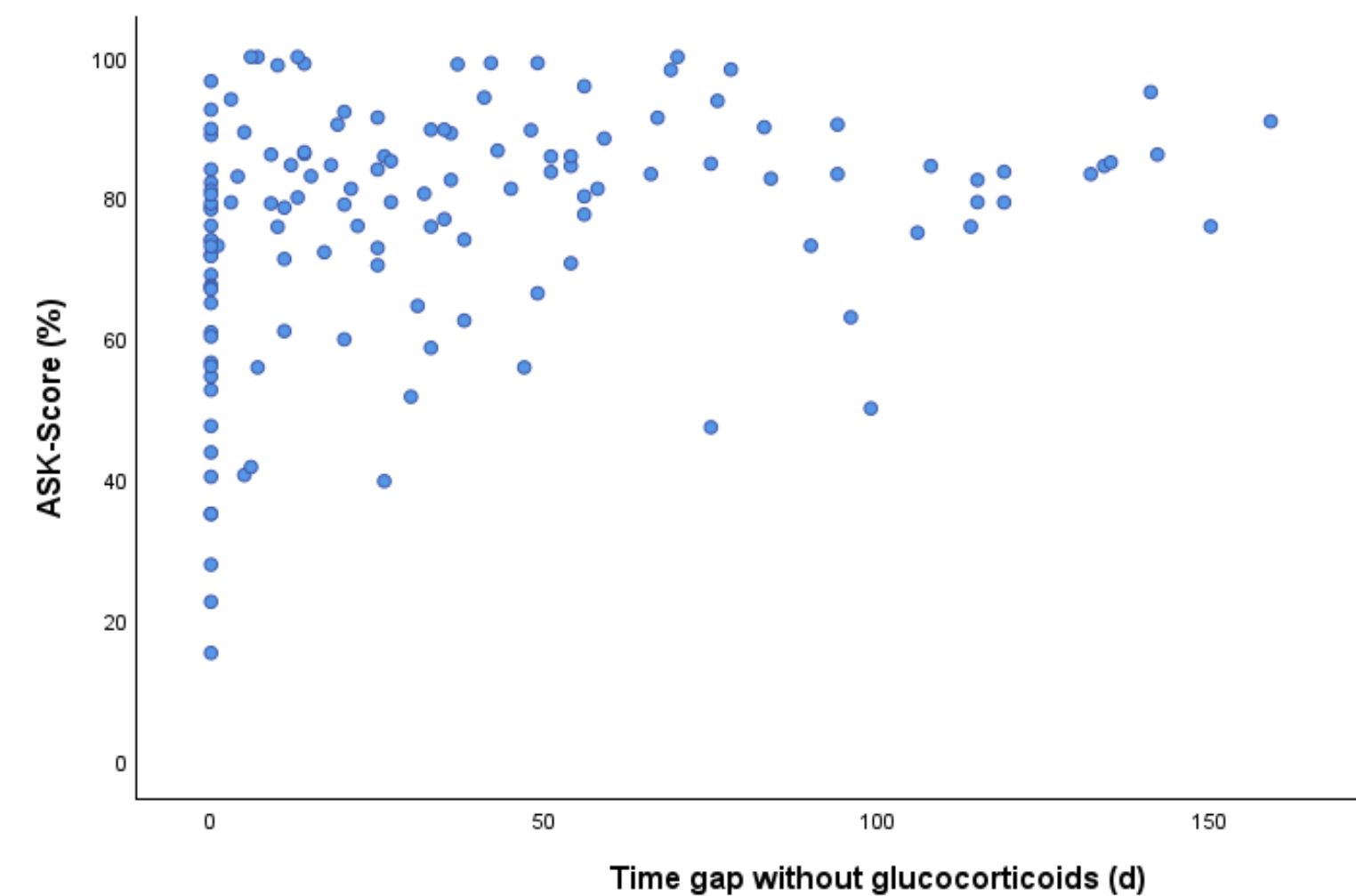**Contact:** Dr. rer. medic. Sabine Kesting – sabine.kesting@tum.de

Figure 2: Scatter plot showing the relationship between time gap without glucocorticoids (days) prior to visit and Activities Scale for Kids© (ASK) Score.

| Linear mixed model analysis | p-value | 95% Confidence Interval | | Pseudo R-Square | |
Dependent variable: ASK-Score (%)		lower bound	upper bound	marginal	conditional
Time gap without glucocorticoids (d)	0.008	0.028	0.176	0.329	0.458
Cumulative glucocorticoid dose 4 weeks (g/m²)	<0.001	-4.410	-1.756	0.343	0.682
Cumulative glucocorticoid dose 3 weeks (g/m²)	<0.001	-5.452	-2.468	0.411	0.720
Cumulative glucocorticoid dose 2 weeks (g/m²)	<0.001	-6.250	-1.672	0.353	0.497
Cumulative glucocorticoid dose 1 week (g/m²)	0.011	-10.343	-1.403	0.331	0.459
Cumulative glucocorticoid dose total (g/m²)	0.355	-0.744	2.051	0.294	0.188

Table 1: Summary of the linear mixed model analysis of Activities Scale for Kids© (ASK, primary outcome) Score and different cumulative glucocorticoid doses.

Results

- Glucocorticoids demonstrate a significant (p<0.05) impact on ASK-Scores: shorter time gaps and higher cumulative doses 1-4 weeks prior to visits are associated with lower ASK-Scores (Fig.2, Tab.1).
- However, there is no significant impact by the total cumulative glucocorticoid dose, that patients received during the treatment.
- A marginal pseudo R-Square of 0.3595 (on average for 1-4 weeks cumulative doses) indicates 36% of the variance explained by only the fixed effects.
- Whereas the conditional pseudo R-Square of 0.5895 on average, including fixed and random effects, can explain up to 59% of ASK-Score variability with the entire model.

Conclusion

With this analysis, we can highlight the negative impact of high cumulative glucocorticoid doses on patients´ ability to perform ADL within just a few weeks. By considering multiple influencing components, we could rise the model´s explanatory power to account for nearly 60% of variance in the outcome. Exercise interventions may help to soften these glucocorticoid-induced impairments by preserving patients´ autonomy and supporting physical regeneration after therapy. This emphasizes the need for further studies to determine timing, intensity and type of targeted exercise interventions.

References

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