ABSTRACT OF PhD DISSERTATION

High frequency skin ultrasound and knemometry in children treated with glucocorticoids

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ABSTRACT

The PhD dissertation is based on clinical studies conducted at the Children’s Clinic, Randers during my appointment as a research fellow at the University of Aarhus and consists of four published papers and a review.

The aims of the work was 1) to clarify methodological aspects of skin ultrasound in children, 2) to evaluate whether short term treatment with glucocorticoids may induce changes in the thickness of cutis or subcutis in children, and 3) to elucidate whether short term growth suppression assessed by knemometry (lower leg length measurement) during glucocorticoid treatment is caused partly or fully by changes in the cutis or subcutis.

High frequency skin ultrasound was performed with the Dermascan C®, version 3 (Cortex Technology, Hadsund, Denmark) throughout the present studies.

A methodological study in healthy children revealed low intra- and interobserver variations in measurement of the cutaneous and subcutaneous thickness (4 to 6%); with this knowledge it is possible to perform valid power calculations before clinical trials, and furthermore the low variations allow trained observers to substitute each in the trials. Exercise was found to increase the thickness of subcutis over the knee, no diurnal variations were detected.

Two parallel randomized, controlled crossover trials were conducted to evaluate the effects of short term treatment with 5 mg prednisolone and 400 µg dry powder budesonide daily, respectively, on short term growth and in the cutis and subcutis.

The subcutaneous thickness was reduced on the extremities and increased on the abdomen during prednisolone treatment, the variations were significantly different. No changes were observed in the thickness of cutis. Negative lower leg growth was observed during prednisolone treatment, and was significantly correlated to the reduced subcutaneous thickness over the knee. However, this could only explain 35% of the growth suppression, the remaining 65% must be due to reduced bone growth or effects on the cartilage.

Budesonide induced no significant changes in the thickness of neither cutis nor subcutis, but reduced the lower leg growth significantly. This growth suppression must also be caused by reduced bone growth or effects in the cartilage.

In conclusion, high frequency skin ultrasound is a sensitive tool for detection of systemic effects of exogenous glucocorticoids. Short term prednisolone treatment induces changes in subcutaneous thickness, whereas inhaled budesonide in a moderate dose does not induce such changes. Knemometric lower leg growth suppression during prednisolone treatment is partly, but not fully, explained by a reduction in subcutaneous thickness over the knee, and growth sup-