Catheter site selection and anthropometric measurements at subjects with type 1 diabetes and continuous subcutaneous insulin infusion

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Objectives:

In recent years, the effectiveness of insulin therapy has improved tremendously with the availability of different needle lengths. The correct site, needle length and technique are emphasised from the start to ensure delivery of insulin into the subcutaneous (SC) tissue. The selection of the insulin catheter length for pump T1D users is based mainly on age and though different sites for insertion have been suggested, it is not clear what the ideal site is according to each person's body type and subcutaneous fat.
The adult study has shown that factors which influence skin thickness (ST) and subcutaneous layer thickness (SCT)was age, gender and BMI (1,2].
The studies done using ultrasonography to measure ST and SCT in children with type 1 diabetes showed that there is a progressive increase in thickness with age and also it varies at different sites (arm, thigh, abdomen and buttocks)(3,4). Children studies comparing different age groups ST and SCT according anthropometric characteristics are lacking.
Aim: To identify the proper sites for insulin catheter insertion according to subcutaneous fat and anthropometric characteristics.

Methods:

Study group was comprised of 43 T1D subjects (median age 7,08, range 1.56-28.0 years, 24 males, median disease duration 2,2 years , range 0.18-20.8 years) who were on CSII and were divided into 3 age categories [≤5 (11 subjects), 5-9 (19), ≥9 years (13)].
Weight, height, BMI, BMI SDS, skin folds, waist and hip circumference and the presence of hypertrophy were recorded. Ultrasound for measuring subcutaneous fat depth was performed at different sites (photo 1). The size of insulin nebula dose and the distance of its edge to the muscle fascia (DTMF) were evaluated (photo 2). In 26 sensor carriers mean sensor blood glucose, SD and Coefficient of Variation (CV) of the last month were recorded.

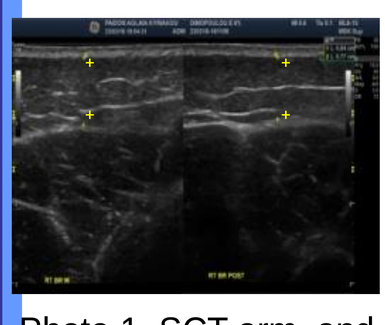

Photo 1. SCT arm and abdomen

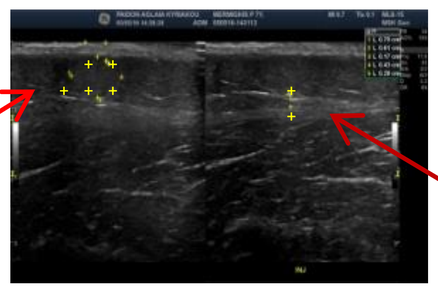

Photo 2.

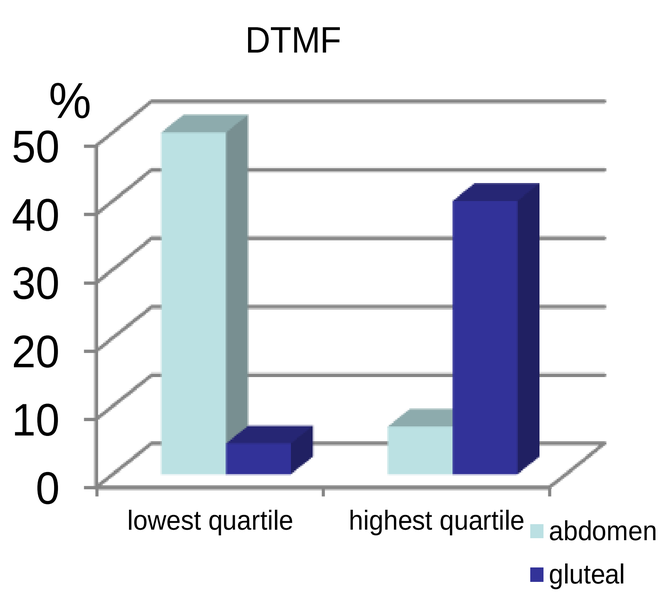

Fig 1

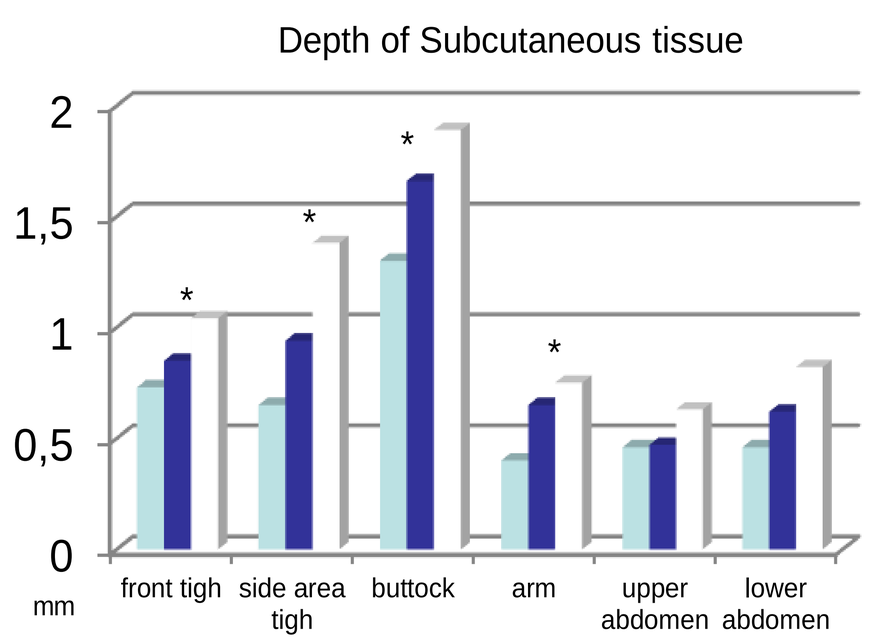

Fig 2

Results:

- There was no difference in gender among age categories.
- Six subjects (age >9years old) used 9mm catheter and 36 6 mm.
- Seven out of 14 patients who had the catheter on the abdomen at the time of examination were at the lowest quartile of DTMF, while those with the catheter on the gluteal region were at higher quartiles (p=0.003) (fig1)
- Subjects who carried the 9 mm catheter had significantly less depth of subcutaneous tissue in the arm compared to those who carried the 6 mm one (p=0.041). However no significant difference was found in the other catheter sites.
- A significant difference was found among the different BMI SDS categories and the depth of subcutaneous tissue in the arm (p<0.0005), the front (p=0.019) and side area of the thigh (p=0.013) and the buttock (p=0.013), but not the upper (p=0.092) and lower part of the abdomen(p=0.312). (fig2)
- No difference was found among the different age categories and the depth of subcutaneous tissue at the above mentioned catheter sites.

Conclusions:

- BMI SDS was better indicator than age to evaluate the subcutaneous fat in order to find the ideal area of catheter site.
- Ultrasound was useful in identifying the proper catheter site especially at thin subjects.

References:

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