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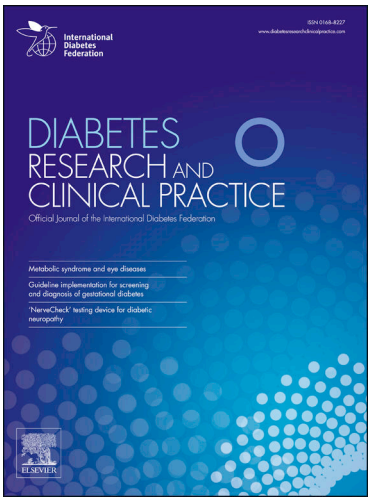

Commentary

Hundred-year experience with insulin and lipohypertrophy: an unresolved issue

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HUNDRED-YEAR EXPERIENCE WITH INSULIN AND LIPOHYPERTROPHY: AN UNRESOLVED ISSUE.

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In the article recently published in Diab Res Clin Pract (1), we described one of the most exciting paths in the history of medicine from the perspective of diabetologists and people with type 1 diabetes. Such a history lasted 100 years, from the discovery of insulin to the most technologically advanced technologies aimed at making treatment as close to physiology and user-friendly as possible. Indeed, we are luckier than others because, by living in Italy and the USA, respectively, we have access to miniaturized and computerized insulin delivery systems, but this is not the case worldwide. Due to that, while receiving many favorable comments from colleagues and friends, we were encouraged to further expand on the issue and go deeper into insulin injection technique.

Specifically, we, PDB and RHE, are signing this letter with SG and FS, two Colleagues not affected by T1DM who have been dealing with the neglected topic of skin lipohypertrophy for years and have directed our attention to the following aspects warranting consideration: (i) primarily due to economic reasons, in several third-world countries, insulin is affordable by just a few people, and in many others newer insulin preparations are not available (2); (ii) insulin is mainly administered through syringes or pens by reusing needles several times, in open conflict with recommendations on correct injection techniques (3); (iii) the availability of specialists is not ubiquitous, and access to care is limited, especially for educational aspects (3); (iv) however, even in rich countries, the most elementary educational rules on how insulin is injected are often disregarded, with the consequent occurrence of lipohypertrophy at the injection sites (4).

We have no weapons or solutions to propose in economically disadvantaged countries as far as access to insulin and the newest administration devices is concerned, because the latter depends above all on the economic availability of the regions and in some cases even of individuals, as well as on national health system organizations. On the local consequences of inappropriate insulin injection practice, instead, we are quite experienced and can therefore propose viable solutions even in the absence of economic resources (4).

According to a recent meta-analysis (5), the average lipohypertrophy rate is 38%, with such a wide range as 2% to 70%, which indicates *per se* the presence of unsurpassed hurdles against proper lipohypertrophy identification (6). Indeed, when asked to switch from the thorough lipohypertrophy identification phase to the one devoted to education on correct injection habits, most patients state: "no one had ever explained that to me" (unpublished personal data).

The topic of correct insulin injection techniques has been the subject of countless publications by authors worldwide (here we quote 5 for all). However, we have already criticized many of those papers, even expected to have passed peer-reviews before publication, for their incomplete, approximate, sometimes incorrect methodology (4,6). We also pointed out that the extensive interest in lipohypertrophy witnessed by the literature indirectly indicates severe educational deficiencies (6,7). Expert Recommendations (FITTER) on best injection techniques published after a workshop held in Rome, Italy in 2015 (8,9) already provided guidelines of how to look for and identify lipohypertrophy and how to educate patients on best injection practice as a low-cost yet highly effective therapeutic education-based behavioral rehabilitation tool (10-12). Also, we recently provided evidence that a continuous reinforcement of the initial educational training is needed to keep alive the memory of the skills and abilities underlying appropriate insulin injection, being the durability of such a memory after initial education not known yet (13). However, we are still working on such an issue and will soon provide new data about that.

From a practical perspective, the diabetes team involved should have the competence and time needed to instruct people with diabetes periodically. In our experience, several patients appreciate the team providing them with a sort of squared mapping drawn on the injected areas, helping them define all the points where to insert the needle, and thus perform a progressive sequence of punctures, changing the site with each injection. This way, they likely, unconsciously memorize the method, thus automatizing their behavior correctly after some time. This simple technique has the advantage of being easily applied to low-income countries and could be effective even where needle reuse is economically unavoidable.

This brief reflection should lead us to take action to improve well-being in people with diabetes all over the world by encouraging diabetes-related voluntary associations and scientific societies, governments, and insulin manufacturers to promote specific information and training campaigns on that and have health care teams and patients to finally engage in a fully effective fight against injection technique errors.

Although 100 years have passed already, we have been struggling with injection-induced skin lesions ever since insulin production, as the earliest investigators already described lipodystrophy for the first time in 1922 !!! (14)

Figure 1. A large lipohypertrophy from incorrect injection technique, as occurring below the navel in a woman with type 2 diabetes on insulin for 4 years. She reported that no one had ever taught her where to inject insulin.

Figure 2. The round area with the cross in the center is an expanding lipohypertrophy in a man with type 2 diabetes on insulin for 2 years. The rest of the abdomen was drawn in squares with a marker for teaching purposes. The patient took a picture of his squared abdomen to check how to perform site rotation after washing off the marker grid. This method helped him remember where to inject insulin sequentially.

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SG e FS discussed the topic with PDB and RHE, and wrote the text. Then, PDB and RHE read it through and, after in-depth criticism, approved it.

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