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Original Research

Injection Technique Practices in a Population of Canadians with Diabetes: Results from a Recent Patient/Diabetes Educator Survey

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ABSTRACT

Objective: A Canadian survey was undertaken to elucidate injection techniques in the population of the country with diabetes and to make appropriate revisions to the 2011 Canadian Forum for Injection Technique recommendations.
Methods: The study involved 503 participants (25% with type 1 diabetes; 75% with type 2 diabetes) from 55 diabetes education centres across Canada. They completed a survey regarding injection technique (i.e. needle length, angle of insertion, incidence of lipohypertrophy, injection routine). Healthcare professionals at the centres also completed a survey regarding their patients' injection techniques. To be eligible for the study, participants had injected either insulin or a glucagon-like peptide-1 receptor agonist for at least 6 months prior to enrolment.
Results: Varying lengths of needles were used for injections; however, 45.3% of participants had changed needle lengths since they had begun injecting. The vast majority of participants (80.4%) injected medication into the abdomen; 36.6% had no explicit injection routine, whereas 31.4% injected into the same site at the same time each day. Overall, 24.6% of patients observed lipohypertrophy at injection sites, while only 13.3% of diabetes educators observed the same complication.
Conclusions: The survey allowed for a greater understanding of the strengths and weaknesses of Canadian patients and clinicians in the treatment of diabetes, particularly with respect to injection practices and procedures.

Mots clés :
enseignement sur le diabète
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agonistes des récepteurs du GLP-1 (*glucagon-like peptide-1*)
insuline
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RÉSUMÉ

Objectif : Une enquête canadienne a été entreprise pour élucider les techniques d'injection de la population diabétique du pays et pour faire les révisions appropriés aux recommandations du Forum sur la technique d'injection (FIT) Canada de 2011.
Méthodes : L'étude comptait 503 participants (dont 25 % souffraient de diabète de type 1 et 75 % souffraient de diabète de type 2) de 55 centres d'enseignement sur le diabète du Canada. Ces participants ont répondu à une enquête portant sur la technique d'injection (c.-à-d. la longueur de l'aiguille, l'angle de l'insertion, la fréquence de la lipohypertrophie, la routine d'injection). Les professionnels de la santé des centres ont également répondu à une enquête portant sur leurs techniques d'injection. Pour être admissibles à l'étude, les participants avaient déjà injecté de l'insuline ou un agoniste des récepteurs du GPL-1 au moins 6 mois avant leur inscription.
Résultats : Différentes longueurs d'aiguilles ont été utilisées. Cependant, 45,3 % des participants avaient changé la longueur des aiguilles depuis le début des injections. La vaste majorité des participants (80,4 %) injectaient le médicament dans l'abdomen; 36,6 % n'avaient pas de routine d'injections formelle, tandis que 31,4 % injectaient dans le même site au même moment chaque jour. Dans l'ensemble, 24,6 % des patients observaient une lipohypertrophie aux sites d'injection, tandis que 13,3 % des éducateurs en diabète observaient cette complication.
Conclusions : L'enquête a permis une meilleure compréhension des forces et des faiblesses des patients et des cliniciens canadiens dans le traitement du diabète, particulièrement pour ce qui est des pratiques et des procédures d'injection.

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Table 1
Study population

Characteristic	Mean	SD	Minimum	Maximum
Age, years (n=501)	53.3	19.7	4.0	93.0
Weight, kg (n=486)	87.7	27.3	21.3	218.0
Height, m (n=472)	1.7	0.2	0.6	2.0
BMI, kg/m^2 (n=472)	31.6	12.7	0.0	180.6
Duration of diabetes, years (n=482)	14.7	10.0	1.0	69.0

BMI, body mass index; *kg*, kilograms; *SD*, standard deviation.

Introduction

Two important international surveys of people with diabetes have provided key insights into current injection technique practices (1,2). The information garnered from the survey led to the subsequent publication of international recommendations (3) that provided guidance to both healthcare professionals and people with diabetes. However, a limitation of the survey and subsequent recommendations was the lack of data from Canada. Thus, a Canadian survey was undertaken to elucidate the injection techniques of the country's population with diabetes and to make appropriate revisions to the 2011 Canadian Forum for Injection Technique (FIT) recommendations (4).

Methods

Study design and population

The study consisted of 503 participants from 55 centres across Canada. Patients and healthcare professionals at each centre completed a separate survey regarding injection technique. The surveys were adapted from previous European injection technique surveys (1,2); however, although the European survey templates were modified to meet Canadian practices, data collection remained intact so that Canadian and international results could be compared. Approval was obtained from the University of Manitoba Health Research Ethics Board; where necessary, local research ethics approval was also obtained. Informed consent was implied by completion of the survey.

Inclusion criteria

To be considered for the study, participants were required to have injected insulin or a glucagon-like peptide (GLP)-1 receptor agonist (liraglutide or exenatide) for at least 6 months by using a syringe, an insulin pen or both. The study had no age limit because parents were permitted to complete the survey on behalf of their children, provided that the children were present at the times the forms were being completed.

Procedure

Diabetes education centres were targeted for patient recruitment. The centres were selected based on their levels of experience and expertise, so established programs in large urban centres were the main contributors of patients. Each centre was asked to complete 10 patient surveys, with an accompanying diabetes educator survey as well as 1 overall diabetes educator survey. The patient survey contained a series of questions regarding injection practices (i.e. devices used, needle lengths, mixing of insulin, injection sites, skin pinchings and site rotations). The diabetes educator who conducted the patient survey reviewed it for completeness and then filled out the accompanying educator survey for the same patient. The overall diabetes educator survey required the educator to palpate the patient's injection sites to evaluate for the presence of lipohypertrophy.

Table 2
Treatment type

Treatment	n (%)
OHA alone	26 (5.2)
Insulin alone	250 (49.9)
GLP-1 receptor agonist	3 (0.6)
OHA and insulin	202 (40.3)

GLP-1, glucagon-like peptide-1; *OHA*, oral antihyperglycemic agent.

Table 3
Injection practices

	Participants using this site n (%)	Pinching-up skin fold n (%)	Injecting at a 90-degree angle n (%)	Injecting into large area n (%)
Abdomen	402 (80.4)	196 (43.5)	401 (93.5)	317 (73.7)
Thigh	78 (15.6)	98 (51.0)	157 (88.7)	43 (25.7)
Arm	19 (3.8)	66 (48.9)	102 (85.7)	9 (20.5)
Buttock	73 (14.6)	25 (36.8)	45 (91.8)	15 (13.8)
Other	19 (3.8)	5 (26.3)	5 (83.3)	3 (60.0)

Statistical analysis

SPSS software (IBM, Armonk, New York, USA) was used to analyze the data. As well, data gathered from previous studies (1,2) were consulted to ensure that proper comparative data were used.

Results

Demographics

Clinical characteristics of the study group are presented in Table 1; 503 individuals (52.9% male, 47.1% female) from 55 centres across Canada participated in the study. Of this group, 25% had type 1 diabetes and 75% had type 2 diabetes. European/Caucasian was the group most highly represented (80.2%); Asian (8.1%), Afro-Caribbean, First Nations and other ethnic groups composed the remaining study population.

Devices and drugs

Of the individuals studied, 49.9% were taking insulin alone, and 40.3% of subjects were using a combination of insulin and oral antihyperglycemic agents to treat their diabetes; the mean length of time on insulin was 7.8 years. The remainder of the study group (9.8%) used combinations of oral antihyperglycemic agents, insulin and GLP-1 receptor agonists to treat their diabetes. Data regarding medication regimens are summarized in Table 2.

Subjects injected their medication with a syringe, pen or insulin pump. Of the study group, 2.6% injected using a syringe alone, and 93.8% injected using an insulin pen alone. The remainder of the group used either an alternative device for injection or a combination of multiple devices.

Varying lengths of needles were used for injections: 1.1% of study participants used 12.7 mm needles; 0.6% used 12 mm needles; 0.2% used 10 mm needles; 17.5% used 8 mm needles; 26.6% used 6 mm needles; 16.9% used 5 mm needles; 0.6% used 4.5 mm needles; 31.8% used 4 mm needles; and 4.7% did not know the length of the needles they used. Less than half of the study population (45.3%) reported that they had changed needle lengths since they had begun injecting.

Overall, 62.4% of subjects using NPH, N or premixed insulin remixed their insulin prior to use. On average, participants rolled the insulin vial/cartridge 9.7 times and/or tipped the pen or insulin