



In the consultation room

Injection technique

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About this series

The aim of the “In the consultation room” series is to provide readers with brief, practical reviews of key aspects of diabetes care that should be covered in the clinic setting. A short set of questions at the end will allow you to test your knowledge.

Author

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Further information

For further information, and to download the latest version of FIT’s injection technique recommendations for the UK (which are reviewed and revised as new evidence emerges), please visit:

www.fit4diabetes.com

Author’s introduction

There is a current trend towards GPs and practice nurses taking more responsibility for the initiation and ongoing management of people with diabetes treated with insulin or glucagon-like peptide-1 receptor agonists. Correct injection technique is crucial for such injectable therapies to achieve optimal effect. Here I highlight the consequences of poor injection technique and detail practical advice on how to identify and tackle the associated problems.

All injectable agents rely on correct injection technique for optimal effect. Incorrect technique, including the use of an inappropriate needle length, failure to rotate injection sites and the re-use of needles, can lead to injectable therapies being absorbed in an unpredictable manner. This can cause immediate problems, such as: hypoglycaemia, if insulin is injected into muscle, where it is absorbed more quickly; hyperglycaemia, if it is injected into damaged tissue, where it will be poorly absorbed (Polak et al, 1996; Birkebaek et al, 2008); and perhaps even ketoacidosis in people with type 1 diabetes. In the longer term, we know that poor glycaemic control can increase the risk of complications including kidney failure, blindness and limb amputation (UK Prospective Diabetes Study Group, 1998), all of which can have a devastating impact for the individual, as well as huge cost implications for the NHS (Diabetes UK, 2012).

A common problem associated with poor injection technique is lipohypertrophy (LH) – the accumulation of fatty, rubbery tissue in the subcutaneous layer, which is often caused by repeatedly injecting into the same area. It has been estimated that about half of people with diabetes will experience LH at some time in their life (Frid et al, 2010). Injecting into areas of LH results in variable absorption and erratic glycaemic control. A recent study has confirmed that incorrect site rotation and needle re-use are the two main causative factors (Blanco et al, 2013). The recommended site for insulin and glucagon-like peptide-1 (GLP-1) receptor agonist injections is the subcutaneous tissue (Frid, 2006). Injecting into the subcutaneous layer allows insulin to be absorbed at a more predictable

rate, which can result in better glycaemic control (Hofman et al, 2007).

A number of factors contribute to good injection technique, including injection site selection, injection site care, the injection process itself, needle length, use of lifted skin-folds if appropriate and rotation of injection sites. In the case of insulin there are further considerations, including the re-suspension of cloudy insulins and the acknowledgement of different absorption rates at varying sites.

Giving appropriate advice to patients

In 2009, a group of experienced and like-minded diabetes specialist nurses formed the Forum for Injection Technique (FIT) to tackle the problem of poor injection technique. In October 2010, the *First UK Injection Technique Recommendations* (FIT, 2010) were published and a second edition was published in 2012 (FIT, 2012). The comprehensive document covers topics such as needle length, site selection and absorption rates, rotation of injection sites, lifted skin-folds, insulin storage and re-suspension, lipohypertrophy, sharps safety and safe disposal of injecting material. Eight key points from the FIT Recommendations are presented in *Box 1*.

The *Diabetes in adults quality standard* (NICE, 2011) specifies that “injection technique including site selection and care” is part of the recommended structured programme of education for people starting injectable therapies. It also states that all healthcare professionals initiating and managing people on insulin should have completed appropriate training and be able to demonstrate their competency.

The *Integrated Career and Competency Framework for Diabetes Nursing* (TREND-UK, 2011) states

Box 1. Eight key points from the *First UK Injection Technique Recommendations*.

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| <p>1 Skin thickness is 1.2–3 mm regardless of sex, age, BMI and ethnicity; therefore, 4-mm needles injected at a 90° angle without a lifted skin-fold will generally give reliable delivery into the subcutaneous layer. However, children, adolescents and slim adults may need to perform a skin-fold when using a 5- or 6-mm needle.</p> <p>2 The subcutaneous layer is the preferred tissue for the absorption of insulin and glucagon-like peptide-1 receptor agonists because it offers stable absorption. If insulin is injected intramuscularly, it may be</p> | <p>absorbed too quickly leading to greater glycaemic variability and potentially an increased risk of hypoglycaemia.</p> <p>3 The rate of absorption of human insulin may be affected by the site of injection, with faster absorption from the abdomen and slower absorption from the thighs and buttocks.</p> <p>4 Needles should be used only once as re-use may cause needle breakage in the skin or “clogging” of the needle and lead to inaccurate dosing. Injections should not be given through clothing as this increases the risk of intradermal injection.</p> | <p>5 Cloudy insulin must be properly re-suspended before use.</p> <p>6 People with diabetes should be taught systematic site rotation as repeated injection into the same area can cause lipohypertrophy.</p> <p>7 The needle should be left <i>in situ</i> for at least 10 seconds after the insulin has been injected to ensure that the full dose is administered.</p> <p>8 Detection of lipohypertrophy requires visual inspection and palpation of injection sites and should be included as part of the routine annual review and always considered where there are unexplained erratic blood glucose readings.</p> |
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that, in order to safely administer and issue insulin and GLP-1 receptor agonists, a “competent nurse” should be able to demonstrate and teach the correct method of self-administration, including:

- Correct choice of needle type and length for the individual.
- Appropriate use of lifted skin-fold, where necessary.
- Site rotation.
- Storage of insulin.
- Single use of needles.

Nurses should also examine injection sites at least annually for detection of lipohypertrophy. ■

Birkebaek NH, Solvig J, Hansen B et al (2008) *Diabetes Care* **31**: e65

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Diabetes UK (2012) *NHS spending on diabetes 'to reach £16.9 billion by 2035'*. Diabetes UK, London. Available at: <http://bit.ly/1fw5Hfc> (accessed 27.03.14)

Forum for Injection Technique (2010) *The First UK Injection Technique Recommendations*

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Frid A, Hirsch L, Gaspar R et al (2010) *Diabetes Metab* **36**(Suppl 2): S19–29

Hofman PL, Lawton SA, Peart JM et al (2007) *Diabet Med* **24**: 1400–5

NICE (2011) *Diabetes in adults quality standard: Quality statement 6 – insulin therapy*. NICE, London. Available at: <http://publications.nice.org.uk/qs6> (accessed 27.03.14)

Author's conclusion

Raising awareness about the consequences of incorrect injection technique is important to ensure that healthcare professionals make the link between erratic blood glucose control and poor injection technique. People with diabetes need to be taught correct injection technique at initiation of the therapy and it must also be reviewed at subsequent consultations. It is vital that healthcare professionals reassess how people with diabetes are delivering their injectable therapy as part of routine follow-up in the same way that inhaler technique is reviewed when monitoring people with asthma or chronic obstructive pulmonary disease. No matter how efficacious a therapy is, if it is not administered properly it will not have optimal effect. Finally, healthcare professionals have a responsibility to acquire knowledge, skills and competencies relating to current best injection technique practice to effectively support the safe use of injectable therapies in people with diabetes.

Polak M, Beregszaszi M, Belarbi N et al (1996) *Diabetes Care* **19**: 1434–6

TREND-UK (2011) *An Integrated Career and Competency Framework for Diabetes Nursing* (3rd edition). SB Communications Group, London. Available at: http://www.trend-uk.org/documents/TREND_3rd.pdf (accessed 27.03.14)

UK Prospective Diabetes Study (UKPDS) Group (1998) *Lancet* **352**: 837–53

Questions to test your knowledge

The answers are not necessarily found in this article.

- 1. The thigh and buttocks are the preferred injection sites when using NPH as the basal insulin.**

Is this true or false?

- 2. Needles with a length of 4 mm will always give reliable delivery into the subcutaneous layer without using a skin-fold.**

Is this true or false?

- 3. Which ONE of the following pairs represent the two main risk factors for lipohypertrophy relating to injections?**

- (a) Incorrect site rotation AND needle re-use
- (b) Incorrect site rotation AND needle length
- (c) Number of injections per day AND needle re-use
- (d) Total daily dose of insulin AND needle length

- 4. Long-acting insulin analogues may be given at any of the injection sites as absorption rates do not appear to be site-specific.**

Is this true or false?

- 5. When using a lifted skin fold, the needle should be immediately withdrawn from the skin after the thumb button plunger is fully depressed.**

Is this true or false?

Answers: 1 – true; 2 – false (in some cases a skin-fold may be needed even with a 4-mm needle); 3 – [a]; 4 – true; 5 – false (the needle should be left in the skin for at least 10 seconds after the thumb button is fully depressed to ensure that there is no leaking and that the full dose has been administered).