# Tips and Tricks for Insulin Administration and Titration

**Cheryl Fletcher RN, CDE**

# Disclosure

- Several slides in this presentation have been used with permission from BD

# What is I.T.?

## Why Does I.T. Matter?

# Question

## What is I.T.?

a) Information Technology
b) Infection Terminology
c) Injection Technique
d) International Timing

# I.T.: Injection Technique

- **Injection Technique is an important skill for patients/clients to:**
  - learn to optimize insulin absorption in subcutaneous tissue and
  - minimize tissue damage

# Never Skip Steps

- Do we know what kind of “steps” to follow for a patient to achieve the best outcomes injecting insulin?
- What if we just stopped skipping steps with our patients injecting insulin?
- What kind of improved outcomes would we expect to see?

# Question

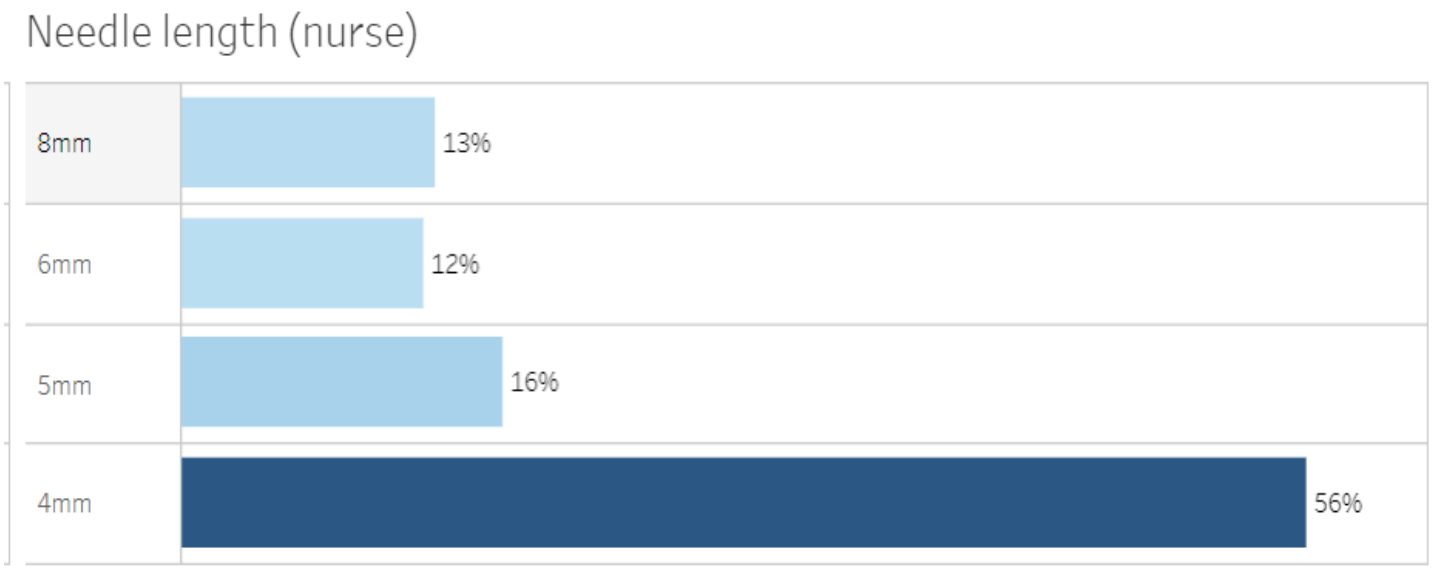
**We should use 4 mm needle tips for the following:**

a) Patients with obesity
b) Emaciated patients
c) Patients with a normal BMI
d) All of the above

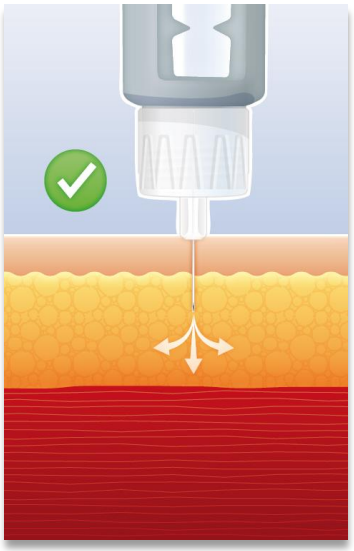
# 5 Steps of I.T.

- **Step 1: Use a 4mm needle tip on insulin pens**
  - Choose the appropriate size needle tip
  - Research shows that skin thickness is consistently about 2 mm. regardless of patient BMI

# What Size Pen Needles are Canadians Using for their Insulin?

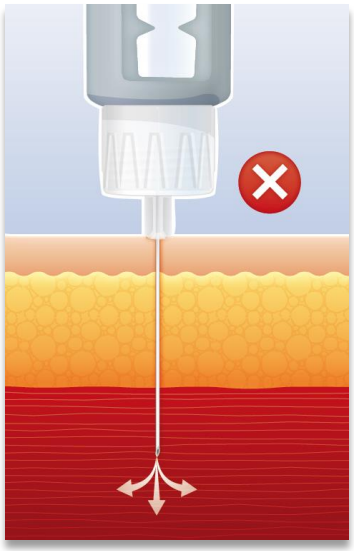


# Getting Insulin Where it Needs to Go



Insulin must be injected into subcutaneous (SC) fat layer for predictable and stable absorption

Subcutaneous Fat Injection:
Consistent insulin absorption



IM deposition leads to accelerated absorption and increased risk of hypoglycemia

IM Injection:
Variable insulin absorption

Hirsch LJ et al. Diab Tech Ther 2014;16(12):867-873

# 5 Steps of I.T

- Step 1: Use a 4 mm. needle tip on insulin pens
- **Step 2: Assess for lipohypertrophy**

# Question

## What is lipohypertrophy?

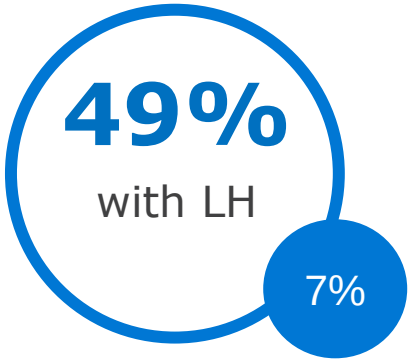
a) An award for getting the most liposuction
b) A lump of fat under the skin
c) Caused by frequent injections of insulin
d) May change insulin absorption
e) b, c & d

# Lipohypertrophy

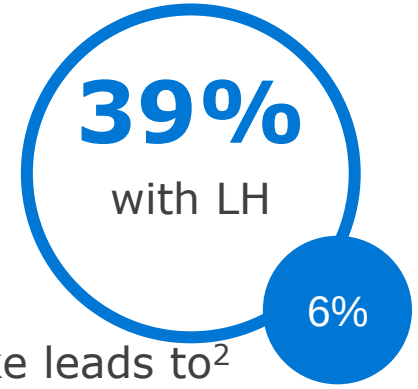
- Lipohypertrophy is a lump under the skin caused by accumulation of extra fat at the site of many subcutaneous injections of insulin
- It may be unsightly, mildly painful, and may change the timing or completeness of insulin action

# Lipohypertrophy (LH) affects glycemic management in different ways[1]

**Almost half** of patients with LH have **glycemic variability**, compared to only 7% of patients without LH.




**More than a third** of patients with LH have **unexplained hypoglycemia**, compared to only 6% of patients without LH.



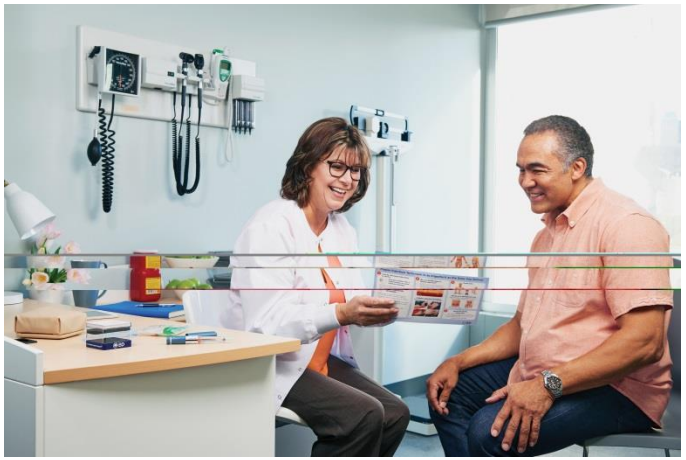

Delayed insulin uptake leads to[2]

46% reduction in insulin exposure

1. Blanco M et al. Diabetes Metab 2013;39:445-453.

2. Famulla S et al. Diabetes Care 2016;39:1486-1492

# How Can We Do Better?

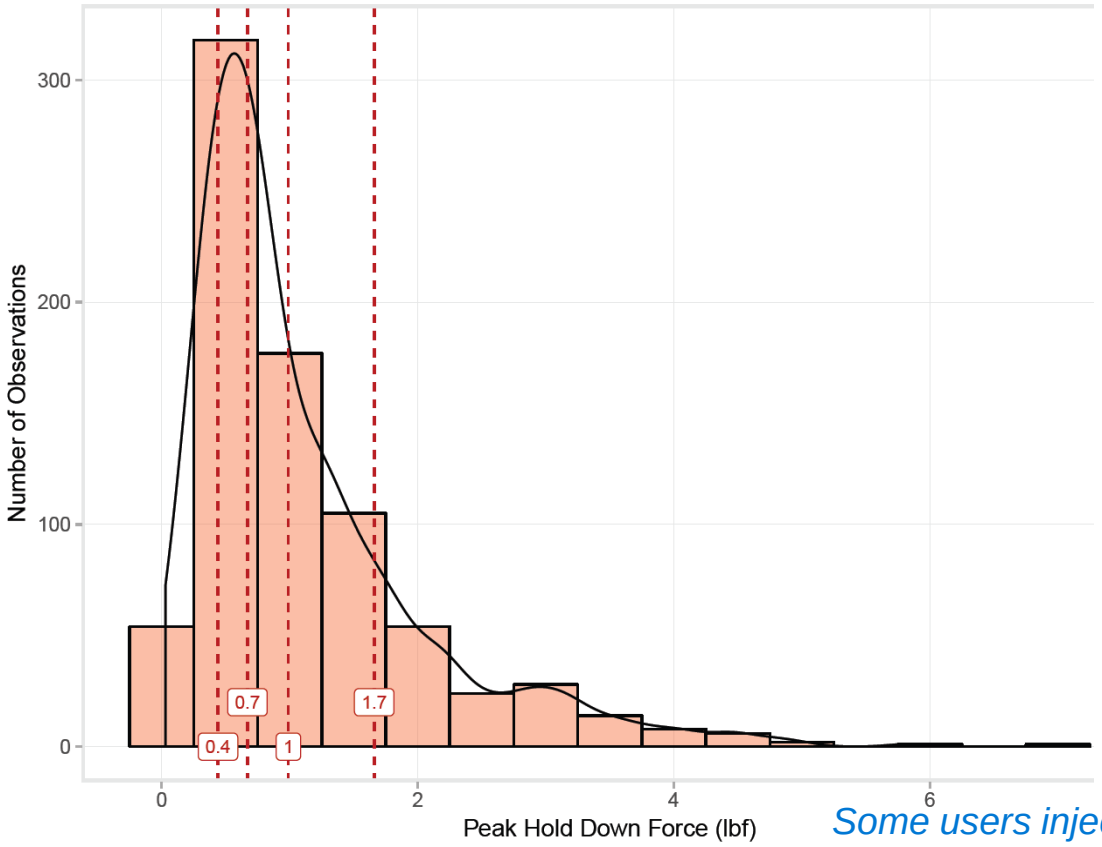


- Look AND Feel for areas of lipohypertrophy (P.O.P.E.)
  - *Prepare*
  - *Observe*
  - *Palpate*
  - *Educate*
- Assess patients at every single visit
  - Consider the use of ultrasound gel or unscented lotion to aid in detection
- Teach patients how they can *self-examine* for lipos!
  (i.e. in the shower with soapy hands)

# 5 Steps in I.T.

- Step 1: Use a 4 mm. needle tip on insulin pens
- Step 2: Assess for lipohypertrophy
- **Step 3: Observe an injection to assess force**

# Anything Greater than 1lb was Considered Excessive Force




A sensor connected to the pen was able to detect the *amount of force* a patient used for an injection

Of the 792 dry injections done by 33 patients:

❖*80% of patients used up to 1.7 lbs of force*

How often are patients showing you how they inject?

*Some users injected with over 4lbs of force applied!*

Rini CJ, et al. (2017, June). *Observation and Quantification of Injection Technique Variability.* Poster session presented at the American Diabetes Association 77th Scientific Sessions. San Diego, CA.

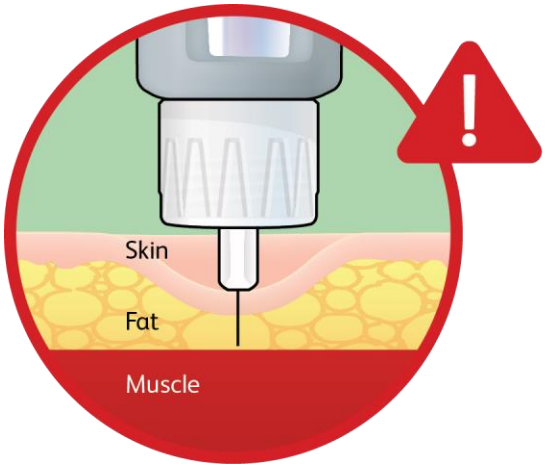
# Force of Injection

- Subcutaneous fat cells are almost like fluid-filled sacks and are highly plastic, they move easily and slide around in their compartments

- *Fat tissue displaces when the pen and needle are pressed onto the thigh* to give the injection

- The risk of IM injections increases with force

# Force of Injection



# 5 Steps of I.T.

- Step 1: Use a 4 mm. needle tip on insulin pens
- Step 2: Assess for lipohypertrophy
- Step 3: Observe an injection to assess force
- **Step 4: Teach an individualized site rotation pattern**

# Question

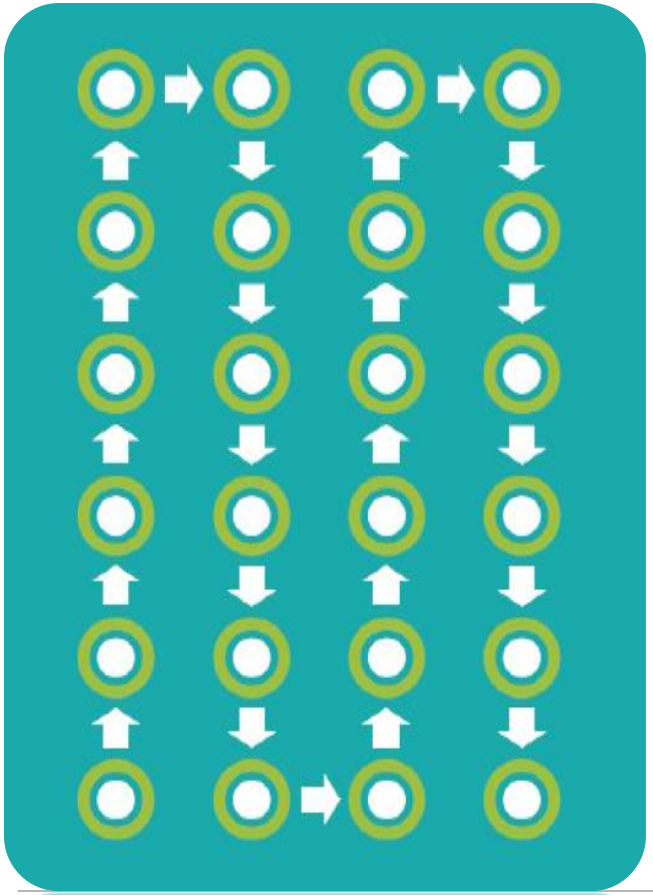
**What site rotation pattern is optimal for patients injecting insulin?**

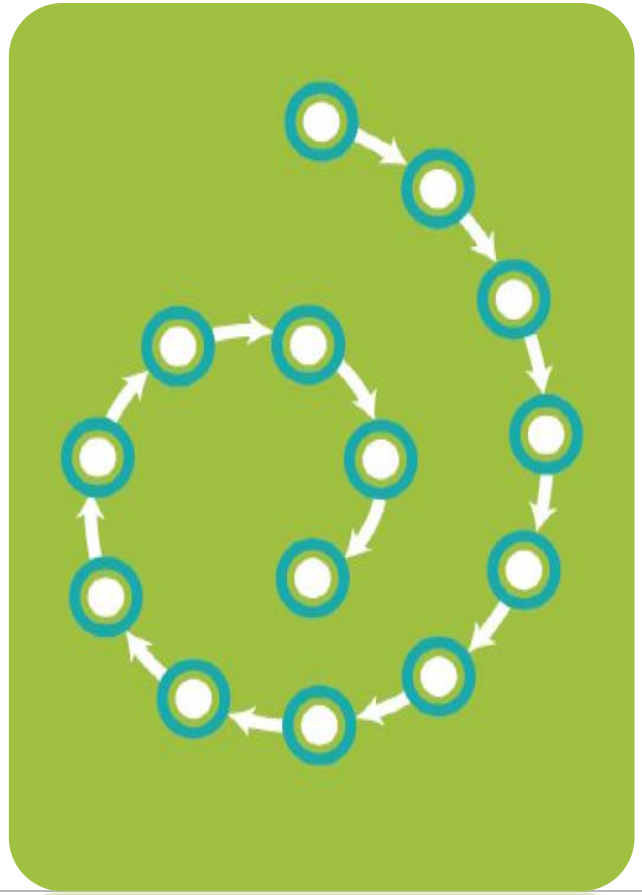
a) Arms and legs as rotation can be optimized at 4 different sites
b) Abdomen starting below the ribs, extending down towards their hips and out towards flank and upper buttocks
c) Whichever site the patient finds most comfortable
d) None of the above

# Diabetes Canada
# Patient Reference Material

- It is really important to change (rotate) where you give yourself insulin to prevent fatty lumps from forming since these can affect how your body absorbs insulin. For example, you can move from one side of your abdomen to the other side, and you can also move your injection site to a different location within each side of your abdomen.
- Avoid a 2-inch area around the belly button as well as scar tissue

# Start Rotating, Keep Rotating



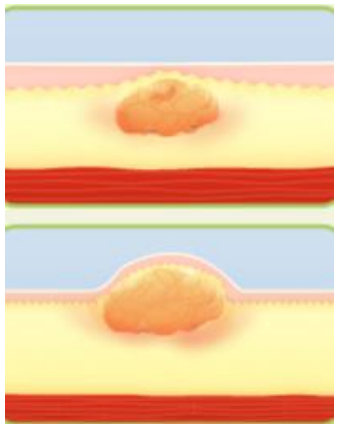


Different patients will remember different patterns

# 5 Steps to I.T.

- Step 1: Use a 4 mm. needle tip on insulin pens
- Step 2: Assess for lipohypertrophy
- Step 3: Observe an injection to assess force
- Step 4: Teach an individualized site rotation pattern
- **Step 5: Instruct to replace needle tips after each use**

# The Reuse Recipe for Lipohypertrophy (LH)



Simple rule:

1) Insulin (acts like a growth hormone)
2) A needle poke acts like an “injury” to the injection site
3) An injury plus growth hormone is a formula for development of scar tissue (Lipohypertrophy)
4) Repeated injections to the same site does not allow healing = the start of “scars”

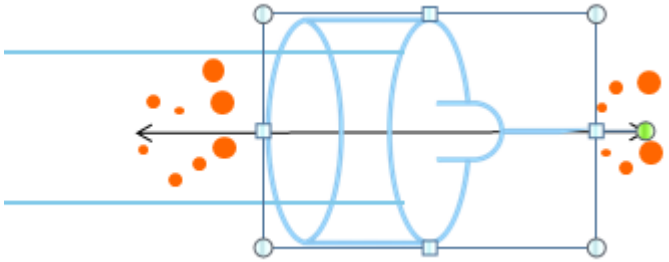
AND:

REUSE of pen needles can increase the degree of injury to a site + growth effect of insulin also promotes development of ‘scar’ tissue (LH) leading to erratic absorption, increased insulin requirements, higher risk of hypoglycemia

# Why Replacing Pen Needles Matters

Pen needles are designed for single use only – needle reuse can result in:

Needle bending, breaking and clogging as well as increased pain[1-3]



+

An Increased Risk of Lipohypertrophy[4]

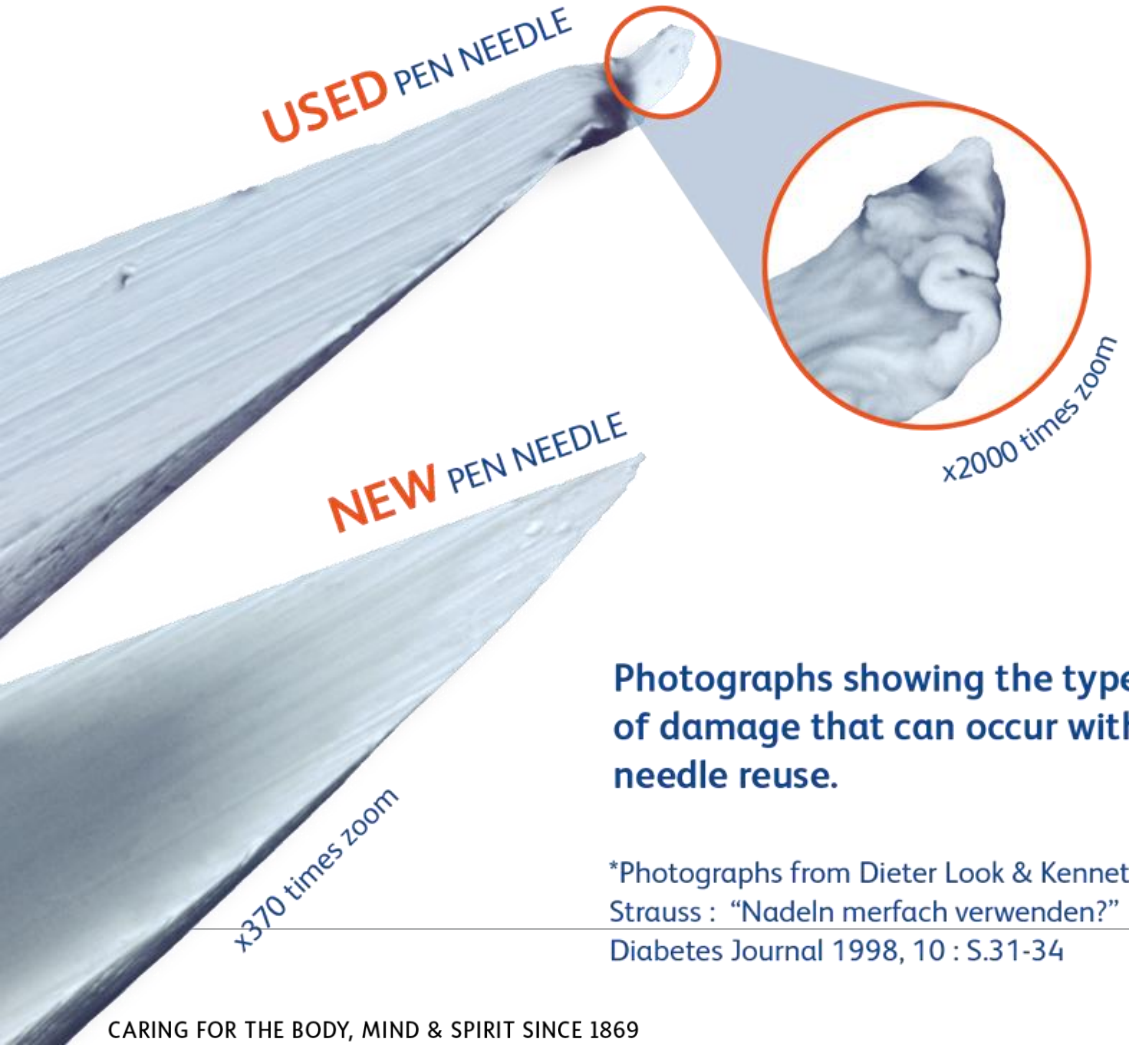
**70%**

A correlation was observed between the presence of LH and the reuse of needles, with a trend towards more LH the more times the needle was reused




1. Ginsberg B, et al 1994
2. Data on file., BD ITG159
3. Look D and Strauss K., 1998
4. Blanco et. al 2013

# Why Replacing Needle Pens Matters



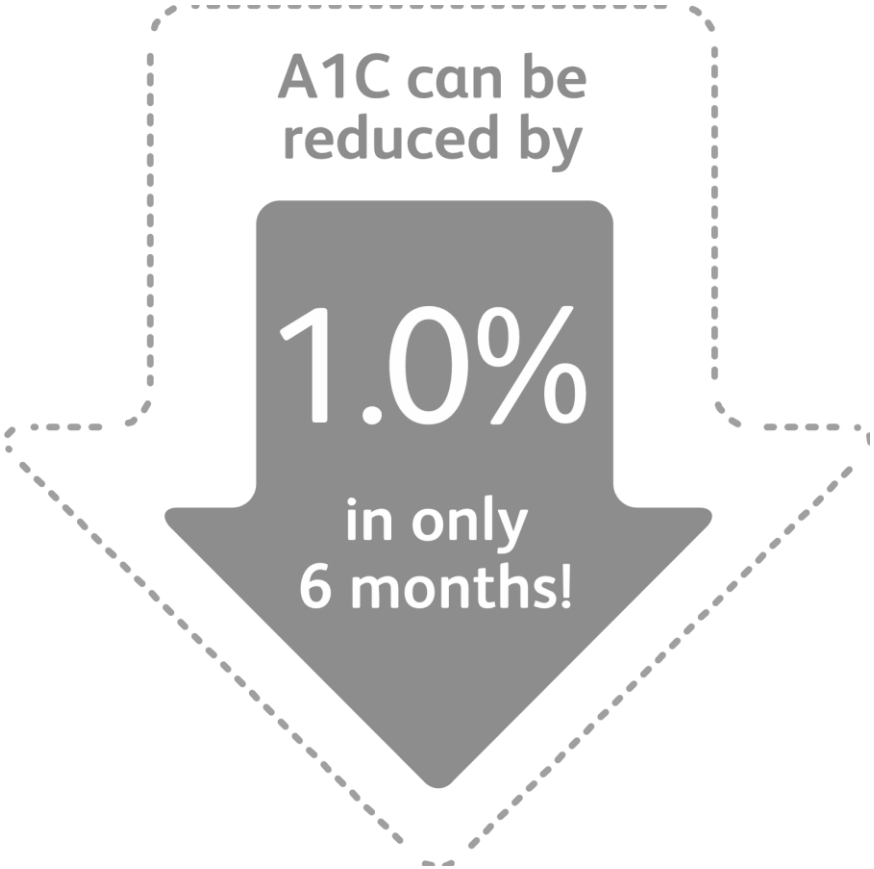

**Photographs showing the type of damage that can occur with needle reuse.**

*Photographs from Dieter Look & Kenneth Strauss : "Nadeln merfach verwenden?" Diabetes Journal 1998, 10 : S.31-34

To the naked eye, it is hard to tell what is happening to a needle each time it is used.

# Because I.T. Matters When Done Well

When injection technique education is provided, including a switch to a shorter needle length *(4 mm or 5 mm pen needles)*, **A1C can be reduced by 1.0%[1]***




**Reference: 1.** Misnikova IV, et al. *Diabetes Ther.* 2017;8(6):1309-1318.

# A Review of the 5 Steps of I.T.

- Step 1: Use a 4 mm. needle tip on insulin pens
- Step 2: Assess for lipohypertrophy
- Step 3: Observe an injection to assess force
- Step 4: Teach an individualized site rotation pattern
- Step 5: Instruct to replace needle tips after each use

# Further Tips For Safe Injections

- Sharps container
- Proper storage of insulin (date, appearance, proper mixing, name, timing)
- Skin care

# In Summary

- Remember to ask what pen needle your patient is currently using as it may differ from when they were first taught insulin
- Consider all of the injection area ‘real estate’ available and how their injection device needs to support wide, effective rotation
- Assess subcutaneous fat tissue distribution among their most often used injection areas
    - Do they need to use a skin lift, even with a 4 mm needle tip?