

Insuflon



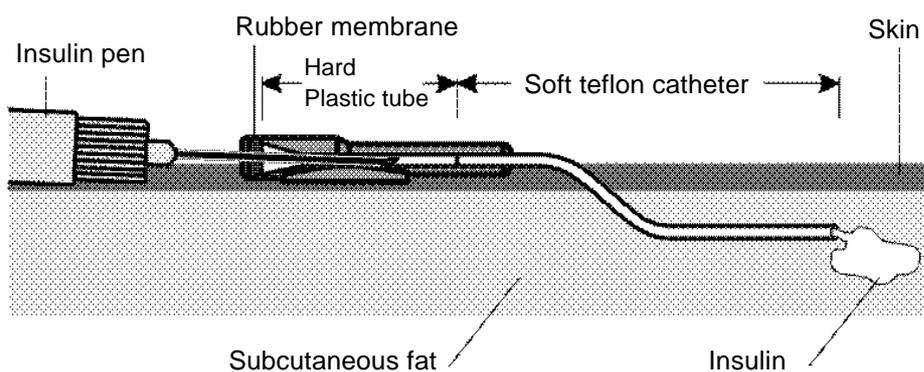
If pain is a problem the injections can be given through an indwelling catheter (eg Insuflon[®]) instead of sticking the child's skin. The insulin is then injected through a rubber membrane.

Our present policy is to give all pre-school children the injections with the help of indwelling catheters. Older children and adolescents are offered to try this method during their first week of subcutaneous injections. We take all the blood glucose tests from an intravenous cannula. These procedures ensure as little pain as possible at the onset of the child's life-long disease. Painless injections have made it less complicated for the family to cope with their crisis reaction and has facilitated their participation in the diabetes education program. After a week or so the child has had time to adjust psychologically and to learn technically the correct injection techniques and can then try regular injections. When discharged from the hospital the children have their free choice of method of injection. Twenty to 25 percent continue with indwelling catheters while the others choose to start with regular injections. Insuflon is even used by many adults who find the injections painful or uncomfortable.

Using indwelling catheters will facilitate the use of multiple injection treatment for small children and will make it easier for those who are not used to giving injections to give insulin, like grandparents, baby-sitters or day-care staff. It will also be easier to give an extra injection when needed since it will not imply more pain for the child. For example, sometimes it is difficult to know how much a small child will eat and it is then better to give half the

Tips for using Insuflon

- à Use EMLA[®]-cream when inserting the catheter in small children and when new to the technique. Apply it for 1½ - 2 hours before insertion.
- à Lift a skinfold and insert Insuflon at a 45° angle of (see figure on next page). Lift the skin with 3 or 4 fingers if the subcutaneous tissue is thin, as is likely to be the case in small children.
- à Insert with a thrust and there will be less risk of "peel-back".
- à Apply the adhesive end that covers the insertion site first. Never try to remove an adhesive that is already stuck to the skin.
- à Insert the injection needle with the opening turned towards the skin and it will not get stuck on the plastic wall. Rotate the needle gently. See figure on page 92.
- à Use an adhesive of stoma-type (such as Compeed[®]) if you experience itching or eczema from the enclosed adhesive.
- à Use an 8 mm (1/3 inch) needle for both pens and syringes and there will be no risk of penetrating the teflon catheter by pushing the needle too far in.



When using Insuflon you pierce a rubber membrane with the needle instead of the skin. The soft teflon catheter is placed subcutaneously and you inject the insulin through it. The catheter is replaced on average every 4th - 5th day. This can easily be done at home and if it hurts one can use local anesthetic cream (EMLA[®]) before replacement.

insulin dose before the meal and perhaps give some extra insulin after the meal depending on how much the child actually eats.

We have not found that more children continue to use indwelling catheters when introducing them at the onset of diabetes, compared to our earlier policy which was to offer indwelling catheters only to those who had problems with injections. However, children using indwelling catheters are probably at less risk for needle-phobia if they are spared frightful injections during the initial period of their disease.

One study showed that in particular the younger patients using indwelling catheters and multiple injection treatment would have found this method more difficult to accept if indwelling catheters had not been available.¹

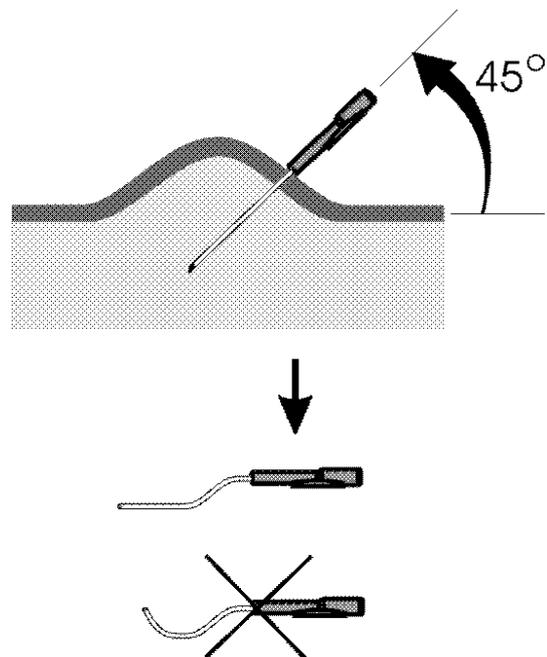
Children and adolescents find that they can take injections without indwelling catheters after a shorter or longer period of time. Many, especially teenagers, use indwelling catheters on and off, often taking a break during the summer, when they prefer a nice suntan on their abdomen.

When should Insuflon be replaced?

The average time between replacements is 4 - 5 days.² Some patients will be quite comfortable replacing it once a week while others may need replacement twice a week. Disinfection with alcohol is recommended before inserting the catheter to minimize the risk for infection.

Which insulin can be given in Insuflon

Small children usually use the same indwelling catheter both for short-acting insulin at mealtimes and for bed-time insulin of NPH-type (e.g. Insulatard, Humulin NPH, Isuhuman Basal). However, if a longer action time of the bedtime insulin is desirable it is better to give it as a separate injection in the thigh. Older children usually accept this without any problems. It is not advisable to mix insulins of Lente-type (e.g. Monotard, Humutard) with short-acting insulin to give in the catheter since part of the short-acting effect will vanish. However, if the patient already is doing well mixing these types

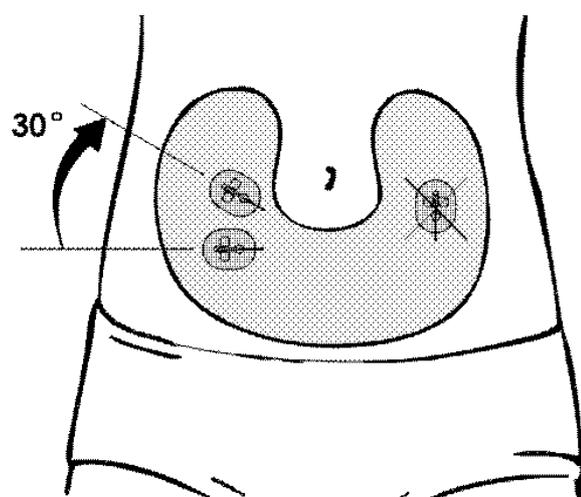


Aim with a 45° angle when inserting Insuflon or a pump needle/catheter. After removal you can check the catheter profile to see how it was inserted. A “fish-hook” appearance (lower picture) indicates that it was inserted too superficially.

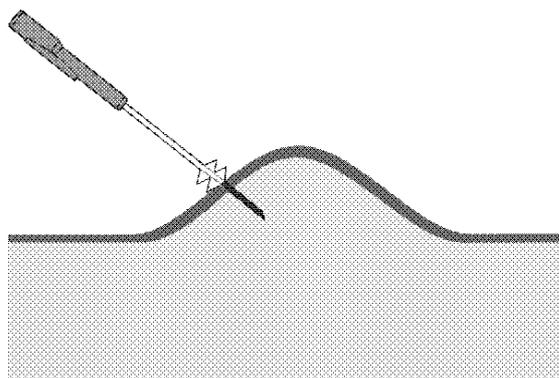
of insulin there should be no disadvantage giving them through an indwelling catheter.

Dead space

The dead space of the catheter (the hollow inside that will be filled with insulin with the first injection)



Use the shaded area of the abdomen for insertion of indwelling catheter. Insert it in a horizontal position or up to 30° from a horizontal line. Otherwise there is a risk of bending the catheter when you lean. If you have problems with lipohypertrophies (“fat pads”) you can insert the indwelling catheters in the buttocks as well.



The catheter can peel backwards on the metal needle (called *peel-back*) if you penetrate the skin too slowly. This is a typical beginner's problem.

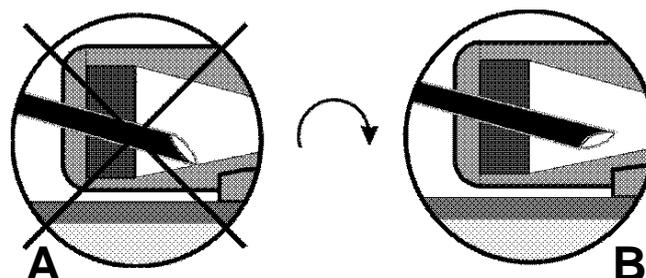
tion) is half a unit of insulin in a clinical setting. For most older children and adults 0.5 U more or less will not make any practical difference. Because 1 drop of insulin of 100 U/ml roughly equals one unit, there are small margins of error if the child's entire dose is only 1 or 2 units. With such small doses we use insulin of 40 U/ml. Many patients prefer to add one extra unit with the first injection after replacing an indwelling catheter. This is OK if they are aware that they will be getting an extra 0.5 U in this way.

When administering the bedtime insulin the catheter will already be filled with short-acting insulin. This will partly be exchanged for intermediate-acting insulin during the injection. Remaining in Insuflon will be a mixture of approximately 0.3 units of bedtime insulin and 0.2 units of short-acting insulin. In practice, these tiny amounts of insulin are usually insignificant.

High blood glucose after a few days use?

Sometimes the blood-glucose level will rise after a few days use of an indwelling catheter. If this happens on a regular basis, there are often signs of lipohypertrophy present. We then instruct to replace the indwelling catheter at shorter intervals. X-ray studies of catheters have shown a delayed absorption in some cases of lipohypertrophy but normal in others.³ The short- and long-term metabolic control were not altered when using Insuflon during a 2-month cross-over study.⁴

Studies of insulin pump users have shown both an unchanged insulin absorption during 5 days' use⁵ and an increased absorption after 3 days' of using of the same injection site.⁶ Studies from Finland



Insert the needle with the opening of the tip directed towards your skin and it will be easier (picture B). Wiggle the needle sideways and rotate it if it still gets stuck.

with indwelling catheters show no change in insulin absorption during 5 days of use.⁷ A Swedish study using radio-actively labelled insulin did not show any change in absorption during 4 days' use of indwelling catheters.⁸

Most patients will have impaired home test results from time to time without knowing the exact reason. This will, of course, also happen to patients using indwelling catheters. As a measure of caution we instruct patients to replace the catheter whenever this happens, although the catheter itself is usually not the cause of the increased blood glucose level.

Infection and redness

We have seen a very low frequency of infections requiring antibiotic treatment (1/140 patient months or 1/850 used catheters). Infection of the catheter canal in the subcutaneous tissue is recognized by redness and/or pain around the insertion site. If you have problems with redness or infections at the insertion site we recommend that you use chlorhexidine in alcohol (or similar disinfectant) for skin disinfection and hand washing. Don't use products containing a skin moisturizer since this causes the adhesive to come loose.



Hygiene is more important if you use an insulin pump or indwelling catheter. Always wash your hands before replacing the catheter. We recommend using chlorhexidine in alcohol for disinfection of the insertion site.

Problems with indwelling catheters?

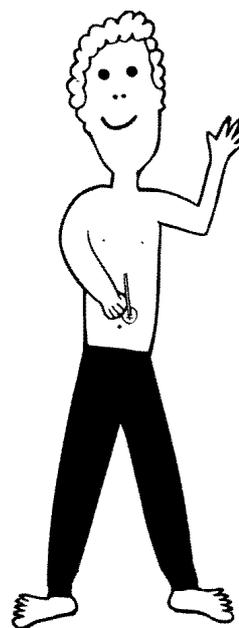
Problem	Measure
Adhesive comes off	Wash off the EMLA®-cream carefully with water. Don't use disinfectant containing skin moisturizer. Let air dry before applying the adhesive. Warm the adhesive with a hand for a couple of minutes after you have applied it. Apply extra tape if needed.
Itching, eczema from adhesive	Apply Hydrocortisone cream. Use a stoma type adhesive (e.g. Compeed®).
Sticky rests of adhesive	Wipe off with medical benzine.
Infection/irritation at the injection site	Wash hands and skin with chlorhexidine in alcohol. Replace the catheter more frequently.
Leakage of insulin	Bent catheter? Replace it! Use 8 mm (1/3 inch) needles or a needle-shortener
Sore skin from plastic wings	Apply a piece of tape beneath the wings.
Scars in the skin from old catheters	Caused by an infection of the injection site. Replace Insuflon more frequently.

Redness and/or itching can be caused by an allergic reaction to the adhesive. Application of 1 % hydrocortisone cream usually helps. If the problem continues we have successfully used a stoma type adhesive (such as Compeed® or Duoderm®). Cut a hole for the catheter hood before applying it.

Itching can also be caused by perspiration in hot weather or during sports activities. The itching usually disappears when one stops sweating.

References

- 1) Hanas R, Ludvigsson J. Experience of pain from insulin injections and needle-phobia in young patients with IDDM. *Practical Diabetes* 1997;14:95-99.
- 2) Hanas R, Ludvigsson J. Side effects and indwelling times of subcutaneous catheters for insulin injections.



ROBERT 8

An eight-year old boy made this drawing of himself using an indwelling catheter. Previously his father had to come home from work twice every day to help his mother hold him, while giving him his insulin injections.

tions: A new device for injecting insulin with a minimum of pain in the treatment of insulin-dependent diabetes mellitus. *Diabetes Res Clin Pract* 1990; 10:73-83.

- 3) Hanas R, Ludvigsson J, Stanke C-G, Östberg H. X-ray appearance of the indwelling catheter when using Insuflon for insulin injections. Abstracts of the 17th Annual Meeting of ISGD, *Hormone Research* 1991; 35:58.
- 4) Hanas R, Ludvigsson J. Metabolic control is not altered when using indwelling catheters for insulin injections. *Diabetes Care* 1994;17:716-18.
- 5) Olsson PO, Arnqvist H, Asplund J. No pharmacokinetic effect of retaining the infusion site up to four days during continuous subcutaneous insulin infusion therapy. *Diabet Med* 6/1993;10:477-80.
- 6) Liu D, Moberg E, Wredling R, Lins PE, Adamson U. Insulin absorption is faster when keeping the infusion site in use for three days during continuous subcutaneous insulin infusion. *Diabetes Res Clin Pract* 1991;12:19-24.
- 7) Käär ML, Mäenpää J, Kniip M. Insulin administration via a subcutaneous catheter. *Diabetes Care* 1993;16:1412-13.
- 8) Hanas R, Carlsson S, Frid A, Ludvigsson J. Unchanged insulin absorption after 4 days' use of subcutaneous indwelling catheters for insulin injections. *Diabetes Care* 1997;20:487-90.