Position Statement on Jet Injectors

Jet injection was first proposed for administering insulin over 35 years ago (1). The stated rationale for the initial devices was to decrease pain of injection compared to needles and syringes (2). There was little further application of jet injection to the treatment of diabetes for over 10 years, although jet injection developed wide use for mass immunization programs. Recently, the application of jet injection to administering insulin has gained increasing attention. Marketing campaigns by private industry have noticeably increased. The Task Force on Jet Injection of the Youth Council of ADA was formed to review the scientific literature available on jet injectors and, if possible, to recommend guidelines for their use.

The available scientific literature is not sufficient to provide recommendations for the general use of these devices. However, sufficient data are available to support the following specific conclusions.

First, jet injection of insulin appears to offer a mechanically reliable and accurate alternative to syringe injection; however, the comparable precision and accuracy of insulin delivery, reliability, safety, and patient acceptability of all available devices when compared to syringe injection need to be assessed by disinterested investigators and the results published in the medical literature (3). Based on results of testing with one model, jet injection does not appear to be associated with increased risk for infection (4), although, again, each model needs to be individually evaluated.

Second, insulin absorption and distribution differ when insulin is administered by jet injection than when syringes are used. Specifically, when insulin is administered by jet injection, it results in a greater decrease in plasma glucose than an equal amount of insulin administered by syringe (5–11). After NPH insulin injection, there appears to be a more rapid rise in free-insulin levels after jet injection (11). Concurrently, the total duration of insulin action appears to be shortened (5,6,11). Whether these changes in insulin absorption and duration of action will meaningfully affect metabolic control in the clinical management of insulin-requiring children and adults remains to be determined. The more rapid onset of insulin action offers theoretical advantages for patients who rely on multiple injections of short-acting insulin but will require a shortening of the interval between injection and eating. Intensified conventional therapy using jet injection (ultralente plus premeal regular insulin) has been shown to result in metabolic control similar to that obtained with continuous subcutaneous insulin infusion. Conversely, the relatively short duration of insulin action makes it reasonable to speculate that jet injection may be less effective for those on a twice daily insulin regimen. Jet-injected intermediate-acting insulin, NPH or lente, may have insufficient duration of action to last until the next injection. This may be a particular problem in the early morning when the dawn phenomenon normally occurs and more, rather than less, available insulin may be necessary. Studies designed to address these issues are needed.

Third, the possibility was raised that insulin could be denatured as a result of its forceful injection through a tiny port compared to injection through a needle. This could lead to an increased incidence of antibody formation. A prospective, controlled trail of jet injection in newly-diagnosed patients needs to address the issue of antibody formation.

The initial expense of purchasing a jet injector needs to be considered. The cost of this device is partially counteracted by saving the need to purchase disposable syringes. The time needed to recoup the initial expense depends on the purchase price; but at this time, the time is from 2 to 5 years. Third-party reimbursement has been

variable. In addition, manufacturer-supplied adapters for each insulin bottle must be purchased. Finally, there are no publicly available data to determine the frequency of injector failure or the frequency with which patients discontinue use of jet injectors to return to insulin syringes. All of this information is needed to better estimate true costs.

One potential role for jet injection may be for adults with an extreme fear of injections whose self-care is compromised by an inability to take insulin. Also, once adult patients understand the potential but undefined risks previously discussed, patient preference would be a valid reason for use of jet injection.

At this time, recommendations for use of jet injection in children should be considered even more tenuous than for adults. Fear of needle injection by children and/or parents should not be treated as an isolated symptom separate from other psychosocial factors related to diabetes management. The neurologic risk of hypoglycemia in children should also be carefully considered in view of the potentially more rapid hypoglycemic effect of jet injection.

To summarize, the Task Force on Jet Injectors recommends initiation of prospective, scientifically sound studies to investigate the following issues: *1*) the effect of jet injection on metabolic control in various patient populations (e.g., 2 vs. multiple daily injections), *2*) the effect of jet injection on metabolic control in insulin regimens differing in frequency of injection and/or insulin type, *3*) complications of treatment (e.g., insulin-antibody formation), *4*) the frequency and significance of aversion to, or discomfort with, needles and, *5*) patient convenience and preference including cost analyses based on complete and independently obtained data.

There are hypothetical risks and benefits attendant to the use of pressure-injection devices. Additional prospective studies will be required before a definitive position on general use can be made.

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Approved by the Executive Committee of the Board of Directors of the American Diabetes Association, Inc., 11 March 1988.