

Ankyloglossia in Breastfeeding Infants: The Effect of Frenotomy on Maternal Nipple Pain and Latch

ANJANA SRINIVASAN,^{1,2} CAROLE DOBRICH,² HOWARD MITNICK,^{1,2}
and PERLE FELDMAN^{1,2}

ABSTRACT

Objective: The aim of this study was to measure the effectiveness of frenotomy in ankyloglossic infants, by quantifying the changes in latch and maternal nipple pain using standardized tools.

Methodology: Infants below 12 weeks of age were recruited from the Goldfarb Breastfeeding Program between August 2004 and February 2005. Infants were selected based on the Frenotomy Decision Rule for Breastfeeding Infants (FDRBI), a new clinical tool for future validation. Latch was assessed using the Latch Tool. Maternal nipple pain was assessed using R. Melzack's Short Form McGill Pain Questionnaire, consisting of the Pain Rating Index (PRI) and Present Pain Intensity (PPI). Frenotomy was performed, followed by repeat latch and pain assessments. Mothers also received breastfeeding counseling throughout and after the procedure. A telephone questionnaire was administered 3 months later.

Results: Twenty-seven (27) mother–infant dyads participated in the study. No complications were seen with frenotomy. All infants had an equal or higher latch score after frenotomy, with an improvement in mean latch score of 2.5 ($p < 0.0001$, 95% confidence interval [CI], 2.038, 2.925). Maternal pain scores decreased significantly after frenotomy, with mean improvements of -11.4 points ($p < 0.0001$, 95% CI, -15.544 , -7.345) on the PRI subscale and -1.5 points ($p < 0.0001$, 95% CI, -1.952 , -1.011) on the PPI subscale. Seventy-seven point eight percent (77.8%) of subjects were still breastfeeding after 3 months; 92% were pain free after 3 months; and 88% felt the frenotomy had helped them.

Conclusion: Timely frenotomy and breastfeeding counseling is an effective intervention, improving latch and decreasing nipple pain.

INTRODUCTION

ANKYLOGLOSSIA, ALSO KNOWN as tongue-tie, is a congenital condition in which the sublingual frenulum extends further than usual towards the tip of the tongue (Fig. 1). Ankyloglossic infants are believed to have an

increased incidence of breastfeeding difficulties resulting from a restriction in tongue movement and latch.

In the 19th century, tongue-ties were routinely divided at birth because of the assumption that these would cause feeding difficulties. In the 1940s and 1950s, with the decreased pop-

¹Department of Family Medicine, McGill University, Montreal, Canada.

²Goldfarb Breastfeeding Program, Herzl Family Practice Center, Sir Mortimer B. Davis Jewish General Hospital, Montreal, Canada.



FIG. 1. Ankyloglossic infant.

ularity of breastfeeding, treatment of ankyloglossia fell out of favor.¹ Today, with increased breastfeeding prevalence, ankyloglossia and its associated breastfeeding difficulties are reappearing as a medical concern.

Ankyloglossia occurs in 1.7% to 4.8% of infants.¹⁻³ Twenty-five percent (25%) to 44% of ankyloglossic infants are thought to have breastfeeding difficulties, including a poor latch, maternal nipple and breast pain, decreased milk supply, poor infant weight gain, and early weaning.³⁻⁹

Treatment with frenotomy may correct the spectrum of breastfeeding problems associated with ankyloglossia. In this procedure, the infant is immobilized and the frenulum is incised by <5 mm. The infant is then made to suckle at the breast, extending the tongue and tamponading any bleeding. The breast milk thus acts as an analgesic and antiseptic.¹⁰ Complications attributed to frenotomy are rare, and include infection, hemorrhage, and salivary gland injury.³⁻¹³ Recent trials including Hogan et al. with 57 subjects and Griffiths with 215 subjects reporting no major complications with frenotomy.^{4,6}

If frenotomy is as safe and effective as it appears to be, it would be of great benefit as a preventive measure. However, the literature on ankyloglossia and frenotomy displays a huge disparity of opinions among health practitioners. A study by Messner and Lalakea⁸ shows that 90% of pediatricians and 70% of otolaryn-

gologists believe that ankyloglossia rarely causes feeding difficulties. Of lactation consultants, 99% believe that it often causes feeding difficulties. Recently, a few studies have demonstrated the effectiveness and safety of frenotomy as a tool to correct the breastfeeding problems associated with ankyloglossia.

A prospective nonrandomized uncontrolled study of 123 ankyloglossic infants showed an improvement in latch and decrease in maternal nipple pain with frenotomy.⁷ However, the tool used to diagnose ankyloglossia in this study does not reliably predict which cases of ankyloglossia will cause breastfeeding problems.²

A prospective nonrandomized uncontrolled study by Griffiths⁶ assessed the indications and safety of frenotomy. Of the 215 ankyloglossic infants studied, 88% had difficulty latching, and 77% of mothers had nipple trauma pre-frenotomy. Within 24 hours of frenotomy, 80% of infants were feeding better. Hogan, Westcott, and Griffiths conducted a randomized controlled trial in 2005⁴ comparing 48 hours of intensive lactation consultant support versus immediate frenotomy for ankyloglossic infants with feeding problems. The study found that ankyloglossia clearly affected breastfeeding, and that frenotomy resulted in improved feeding and decreased maternal nipple pain. However, feeding and pain were assessed only by maternal self-report.

Research questions abound. There is no simple reliable tool to diagnose what constitutes clinically important ankyloglossia.² This makes it hard to identify a target population for frenotomy studies and provide clear indications for frenotomy. As well, the relationship among maternal nipple pain, infant latch, ankyloglossia, and frenotomy need to be examined more closely. For example, how much difference is frenotomy likely to make in the various outcomes? This study attempted to address some of these concerns.

The aims of this study were to: (a) measure changes in latch and maternal nipple pain before and after frenotomy in ankyloglossic infants, using standardized tools; and (b) assess at 3-month follow-up whether frenotomy prevents premature weaning.

TABLE 1. FRENOTOMY DECISION RULE FOR BREASTFEEDING INFANTS

Mother with nipple pain/trauma while breastfeeding AND/OR inability to maintain latch AND/OR poor weight gain in the infant (<15 g/d), AND A visible membrane anterior to the base of the tongue, which restricts tongue movement, leading to:

An inability to touch the roof of the mouth, OR
 An inability to cup an examining finger, OR
 An inability to protrude the tongue past the gum line

MATERIALS AND METHODS

Mother–infant dyads were recruited through the Goldfarb Breastfeeding Program at the Jewish General Hospital. Infants were referred by public health nurses, in-hospital postpartum nurses, family physicians, obstetricians, pediatricians, lactation consultants, and other patients. Referrals were solicited by mailed information on the study to various hospitals and local community health centers, as well as by word of mouth. The study was approved by the SMBD Jewish General Hospital Research Ethics Board.

All mothers with infants under the age of 12 weeks who presented to the Goldfarb Breastfeeding Clinic between August 2004 and February 2005 were approached to participate in the study. Mothers must have intended to begin or continue breastfeeding. Infants were selected based on the Frenotomy Decision Rule for Breastfeeding Infants (Table 1). Babies with other congenital anomalies or developmental

delay were excluded from the study, as well as mothers who were not willing to participate.

Consent and baseline data

Selected mothers were asked to sign a consent form in which the objectives and details of the study were clearly explained. The consent form was written in both English and French, as all subjects understood at least one of these languages. The following information was recorded at that time: current date, maternal age, type of delivery, parity, and infant's date of birth, gender, and birth weight. Concomitant maternal and infant diagnoses related to breastfeeding were also recorded.

Latch

The baby's latch was assessed using the Latch Tool (Table 2). This tool has been validated to identify mothers at risk for early weaning because of sore nipples.¹⁴ It was chosen because of its ease of administration and widespread use in the hospital's maternity ward. Latch scores may range from 0 to 10; higher scores suggest better latches. A score of 9 or above is considered an optimal latch.¹⁴

Maternal nipple pain

The mother's nipple pain was assessed using the Short-Form McGill Pain Questionnaire (Table 3).¹⁵ English and French versions of this questionnaire have been validated for use in various types of pain, but have never been used

TABLE 2. LATCH TOOL

Score	0	1	2
L (latch)	Baby too sleepy to latch	Repeated attempts to hold nipple in mouth stimulates baby to suck	Baby grasps breast with tongue down, lips flanged and rhythmic sucking
A (audible swallow)	None	A few auditory swallows with stimulation	Spontaneous and intermittent if baby <24 h of age; spontaneous and frequent if baby >24 h of age
T (nipple type)	Inverted.	Flat	Everted (after stimulation)
C (breast/nipple comfort)	Severe discomfort	Mild-moderate discomfort	Nontender
H (help)	Full assist	Minimal assist	No assistance needed

From: Riordan J, Bibb D, Miller M, and Rawlins T. Predicting breastfeeding duration using the LATCH breastfeeding assessment tool. *J Hum Lact* 2001;17:20–23.

TABLE 3. SHORT-FORM MCGILL PAIN QUESTIONNAIRE

Quality of pain	PRI (Pain Rating Index)			
	None (0)	Mild (1)	Moderate (2)	Severe (3)
Throbbing				
Shooting				
Stabbing				
Sharp				
Cramping				
Gnawing				
Hot-burning				
Aching				
Heavy				
Tender				
Splitting				
Tiring-exhausting				
Sickening				
Fearful				
Punishing-cruel				
<i>PPI (Present Pain Intensity)</i>				
No pain:	0			
Mild pain:	1			
Discomforting pain:	2			
Distressing pain:	3			
Horrible pain:	4			
Excruciating pain:	5			

From: Melzack R. The Short Form McGill Pain Questionnaire. *Pain* 1987;30:191-197.

to assess maternal nipple pain. The questionnaires were administered to the subjects by one of the investigating team members, in either English or French. There are two subsets to this questionnaire: the Pain Rating Index (PRI) and the Present Pain Index (PPI). The PRI consists of rating the intensity of various types of pain such as "throbbing" or "shooting." Scores range from 0 to 45, higher scores signifying more pain. The PPI simply asks the patient to rate her overall pain on a scale of 0 to 5; higher values signify more pain.

Frenotomy

The infant was immobilized in a sheet while an assistant positioned the neck and head. The index and middle fingers of one hand were used to isolate the frenulum, while the other hand performed the frenotomy, under direct vision. An incision of 2 to 5 mm was made using sterile scissors, severing the entire membranous part of the frenulum. Sterile cotton-tipped swabs were used to briefly compress any bleeding that occurred from this procedure. The baby was then immediately given to the mother, who was instructed to place him or her on her breast to feed.

The McGill Pain Questionnaire and Latch Tool were readministered during the same visit, within 10 minutes of the frenotomy.

Lactation counseling

Mothers were seen by a lactation consultant or physician trained in lactation before the pain questionnaire was administered, as well as throughout and after the procedure. Latch adjustment and general breastfeeding education were given as part of the visit to the Goldfarb Breastfeeding Program.

Follow-up questionnaire

Three months after the frenotomy, the participants were contacted by phone and asked the following yes or no questions:

1. Are you still breastfeeding?
2. Do you have nipple pain?
3. Do you feel that the clipping of your baby's tongue-tie helped?

Data analysis

The authors describe baseline continuous measures using mean \pm standard deviation

(SD) or median (interquartile range) when data is skewed, and categorical variables as percentages. Changes in latch score and pain score were analyzed using paired *t*-tests. Subgroup analyses comparing different groups based on latch score were compared using the non-parametric Mann-Whitney U-Test. All analyses were done using Stat-View for Windows (SAS Institute, Inc., Cary, NC).

RESULTS

Baseline data

A total of 27 mother–infant dyads were entered into the study. All mothers who were approached agreed to take part in the study. All babies were term, singletons, and had uncomplicated neonatal courses. No other infant diagnoses besides ankyloglossia were discovered upon questioning. The subjects came from varied ethnic backgrounds. Please see Table 4 for details about demographic characteristics of the study population.

Frenotomy

No complications were noted during or after frenotomy. There were no extended incidents of bleeding requiring active management, no infant fever, and no hospital admissions.

Concomitant diagnoses related to breastfeeding

All patients were referred to the clinic for ankyloglossia with symptoms such as maternal

nipple pain, trauma, latching difficulties, and/or poor infant weight gain. One subject was found to also have vasospasm of the nipple. Two subjects were also diagnosed with decreased milk supply.

Latch scores

All infants had an equal or higher latch score after frenotomy, as shown in Figure 2.

Pain scores

All subjects had decreased nipple pain after frenotomy, as shown in Figure 3. The most commonly picked pain characteristics were “tender,” “tiring-exhausting,” and “gnawing” pre-frenotomy; and “tender,” “hot-burning,” and “aching” post-frenotomy.

Pain scores based on quality of latch post-frenotomy

Improvements in mean pain scores were looked at by comparing subjects who had optimal latches post-frenotomy (latch scores of 9 or above), and subjects who did not. Subjects who had optimal latches post-frenotomy had greater improvements in pain after frenotomy, compared with those who had suboptimal latches post-frenotomy, as shown in Figure 4.

Three-month questionnaire

Of the 27 study participants, 25 answered the 3-month telephone questionnaire. The other two subjects were known to have stopped

TABLE 4. BASELINE DEMOGRAPHIC CHARACTERISTICS OF SUBJECTS

	Description	Range	Mean	Median
Gender	18 male, 9 female			
Age at frenotomy		2–71 d old	19 d (SD: 19)	10 d
Infant birth weight		2280–5100 g	3475 g (SD: 570)	
Maternal age		17–37 y	28 y (SD: 5)	
Mode of delivery	20 born by vaginal delivery, 6 born by Cesarean section (information missing on one subject)			
Language of preference	13 subjects preferred English, 14 subjects preferred French			

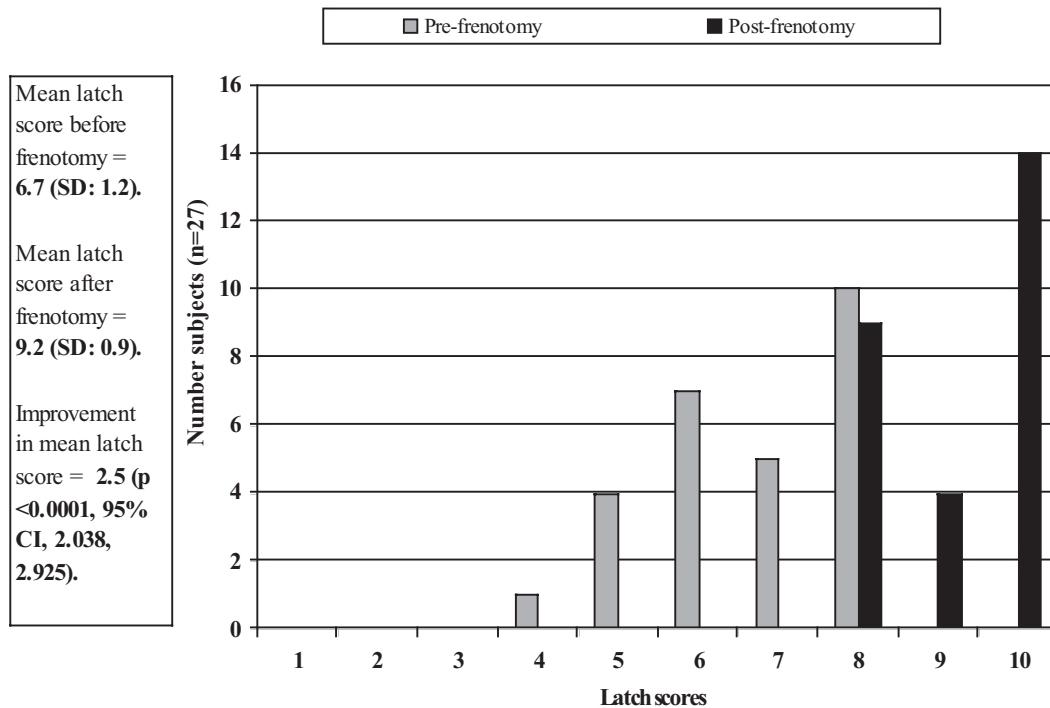
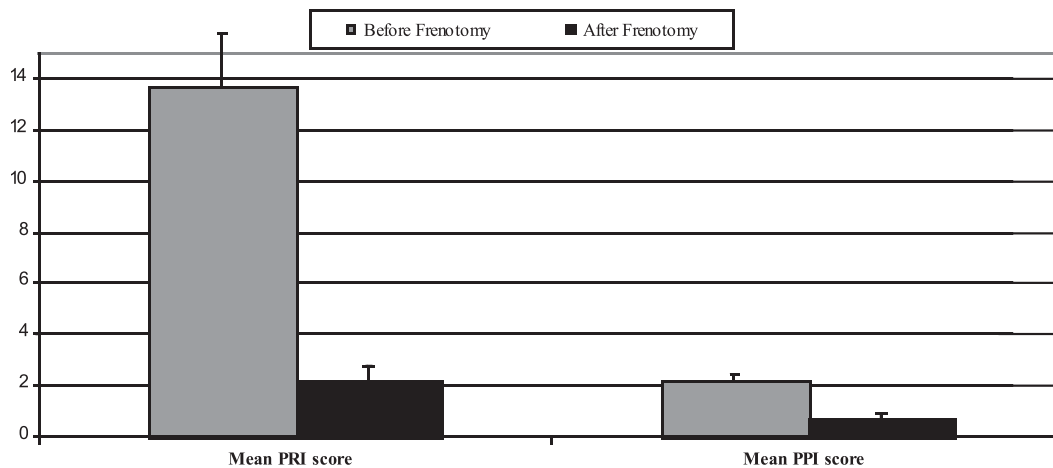


FIG. 2. Comparison of latch scores pre- and postfrenotomy.

breastfeeding (they had informed the secretary of the clinic), but were unavailable for further questioning. Twenty-one (21) out of 27 (77.8%) were still breastfeeding; 23 out of 25 (92%) were

pain free; and 22 out of 25 (88%) felt that the frenotomy had helped. Reasons for stopping breastfeeding included persistent nipple pain, breast infection, and personal reasons.



Prefrenotomy mean PRI: 13.7 (SD: 10.9), range 0 to 37.
 Postfrenotomy mean PRI: 2.2 (SD: 3.1), range 0 to 11.
 Decrease in mean PRI: 11.4 ($p < 0.0001$, 95% CI, -15.544, -7.345).
 Prefrenotomy mean PPI: 2.2 (SD: 1.3), range 0 to 5.
 Postfrenotomy mean PPI: 0.7 (SD: 0.9), range 0 to 3.
 Decrease in mean PPI: 1.5 ($p < 0.0001$, 95% CI, -1.952, -1.011).

FIG. 3. Improvement in pain pre- and postfrenotomy.

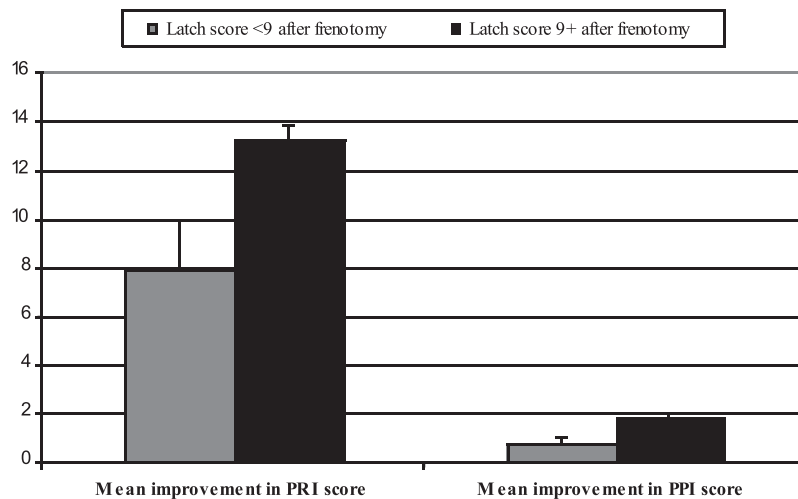


FIG. 4. Improvement in pain based on quality of latch.

Mean improvement in PRI in subjects with optimal latches postfrenotomy: 13.2 (95% CI, -18.069, -8.385).

Mean improvement in PRI in subjects with suboptimal latches postfrenotomy: 7.9 (95% CI, -16.512, -0.735).

Mean difference in PRI changes between subjects with optimal latches and those with suboptimal latches: 5.3 ($p = 0.21$, 95% CI, -3.277, 13.944).

Mean improvement in PPI in subjects with optimal latches postfrenotomy: 1.8 (95% CI, -2.379, -1.287).

Mean improvement in PPI in subjects with suboptimal latches postfrenotomy: 0.8 (95% CI, -1.618, 0.062).

Mean difference in PPI changes between subjects with optimal latches and those with suboptimal latches: 1.1 ($p = 0.03$, 95% CI, 0.134, 1.977).

DISCUSSION

As more and more benefits to mother and infant from breastfeeding are discovered, the importance of eliminating barriers to breastfeeding success becomes evident. Ankyloglossia likely constitutes such a barrier, causing problems such as poor latch, maternal nipple pain, and early weaning.¹⁻⁶

Infant frenotomy did not lead to any complications in this study. In fact, complications are quite rare.³⁻⁷

The authors found that frenotomy and counseling improved latch immediately in most of the subjects. This finding goes along with the hypothesis that ankyloglossia interferes with latch, and correction of the abnormality corrects the latch as well. This has been demonstrated in other studies;^{4,6,7} however, the degree of improvement has never been quantified using a validated tool such as the Latch Tool.

Frenotomy and counseling decreased maternal nipple pain almost immediately, as demonstrated by the striking decrease in PRI and PPI scores. It is important to note that nipple pain may have many causes, including infant ankyloglossia, fissures, thrush, and others. Many of the subjects had significant nipple trauma at the time of the first visit. However, the fact that the pain improved so immediately and drastically after frenotomy strengthens the

authors' hypothesis that the maternal nipple pain seen in ankyloglossia can be treated successfully with frenotomy.

Not unexpectedly, it was found that subjects who had optimal latches postfrenotomy had a larger decrease in PRI and PPI than those who had suboptimal latches. When frenotomy was able to optimize the latch, the maternal pain relief was greater. When postfrenotomy latch remained sub-optimal, maternal nipple pain decreased less. This was significant only for the PPI scores. This study adds to information from previous trials^{4,6,7} in that it attempts to quantify the improvement in maternal nipple pain. The authors also attempted to find a relationship between latch and maternal pain. The findings confirmed the hypothesis that the poor latch seen in ankyloglossia contributes to maternal nipple pain.

The 3-month follow-up confirmed that maternal pain relief after infant frenotomy was not only immediate but also lasting. The breastfeeding continuation rate was much higher than that of the general Quebec population. The ELDEQ study (longitudinal study of child development in Quebec) quotes a breastfeeding continuation rate of only 47% at 3 months postpartum, based on data collected among Quebec women between 1998 and 2002.¹⁶ Of course, the women participating in this study were motivated to seek help at the clinic, an indication of their commitment to breastfeeding.

The authors' observation that babies with ankyloglossia were more often male has also been observed by others,^{2,6} but remains unexplained. It is important to note that ankyloglossia needing frenotomy was seen more in males, not simply the diagnosis of ankyloglossia. Male infants may have more ankyloglossia, or may be more likely to present with breastfeeding problems associated with ankyloglossia. This remains to be studied further.

Shortcomings of this study include the lack of a randomized control group. All subjects received both counseling and frenotomy; therefore, the improved latch and decreased pain could be a result of either or both. The separate effects of counseling and frenotomy could not be studied. Subjects also could have been biased about the positive effect of frenotomy. The tool used to assess ankyloglossia has not yet been validated. However, the authors felt the need to use it in this study, before proceeding to validate it and use it in larger studies.

CONCLUSION

Breastfeeding support and promotion are important and effective public health measures.¹⁷ Ankyloglossia can cause poor latch and maternal nipple pain. Timely and appropriate frenotomy and counseling are safe and effective interventions that can improve latch and decrease maternal nipple pain.

The authors' new Frenotomy Decision Rule for Breastfeeding Infants may provide an easy-to-use tool to identify study subjects for randomized controlled trials of frenotomy, and eventually assist clinicians in deciding whether frenotomy is indicated in ankyloglossic infants. Validation of this rule is urgently needed and presently in preparation.

INVESTIGATING TEAM

The investigating team consisted of AS, PF, HM, and CD. PF and CD developed the Frenotomy Decision Rule for Breastfeeding Infants. Any member of the team, depending on their availability at the clinic that day, did the re-

cruiting of appropriate subjects, data gathering, administration of questionnaires, as well as breastfeeding counseling. The frenotomies were performed by one of the three physicians on the team. The counseling and test administration was done by either CD or the physician performing the frenotomy. The 3-month telephone questionnaires were administered solely by AS.

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Address reprint requests to:
Anjana Srinivasan, MDCM, CCFP
159 Dresden
Town-of-Mount-Royal
Quebec H3P 3K1, Canada

E-mail: Anjana2000@yahoo.com