Clinical Report

Appropriate Spoon Form for Feeding of Liquids in Infant Feeding Development

Ryo Ishida, Mai Ohkubo, Tetsuya Sugiyama*, Yasutoshi Honda**,
Miho Hosoya***, Misuzu Hattori*** and Takahiro Kawata***

*Department of Dysphagia Rehabilitation and Community Dental Care,
Tokyo Dental College,*

1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan

** Department of Removable Prosthodontics and Gerodontology, Tokyo Dental College,
1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan*

*** Department of Dentistry, Fukuyama Central Hospital, Hiroshima, Japan*

**** Combi Corporation, Tokyo, Japan*

Received 24 December, 2010/Accepted for publication 25 February, 2011

Abstract

Feeding development in infants is important not only for the purpose of acquiring nutrition but also for developing the ability to intake liquids. Our previous study showed that the introduction of a straw was appropriate after an infant has acquired the ability to sip liquid from a spoon and/or cup. In this study, we investigated the effect of a bowl-shaped spoon on liquid intake. The aim of this study was to determine the appropriate form of spoon for infant feeding development. Eleven healthy infants (3 girls and 8 boys, 10–18 months old, mean age: 13.3 months) were recruited with their guardians' consent. We made 3 types of prototype spoon: A, oval (a standard *renge* soup spoon); B, flared-out (with the margin of the bowl flared out); and C, hemispherical (with a hemispherical bottom, and smaller than type A or B). We observed infants taking liquid supported by their mothers and evaluated the following responses: 1) confusion with regard to lip position, 2) spillage and 3) choking. Type C showed statistically less confusion with regard to lip position than type A or B ($p < 0.01$), and B showed less than type A ($p < 0.05$). No statistically significant differences were observed in spillage or choking among the three types of spoon. The *renge* soup spoon is often used to smooth the transition from breast/bottle to cup feeding. In this study, we demonstrated the appropriate spoon form for infant feeding development.

Key words: Spoon form—Taking liquid—Lip position—Spillage—Choking

Introduction

Feeding development in infants is important not only for the purpose of acquiring

nutrition, but also for developing the ability to intake liquids. The ability to intake liquids transitions from sucking milk from a breast/bottle to sipping liquid with a spoon and/or

New Inventions.

AN INFANT'S FEEDING SPOON.

THE need for a better form of spoon for the feeding of small infants has been long felt and I have, therefore, designed a spoon which seems to fulfil all requirements, in that there is no chance of spilling the

Fig. 1 An infant's feeding spoon in 1927

Barton first reported an infant feeding spoon¹⁾ designed to have beak-like shape that would make it easy to pour water; bottom of bowl has depression.

cup at about 8 months of age³⁾. When infants reach the age of about 8 months, mothers often begin to use some kind of feeding device, such as a spoon, cup, spout mug or straw mug. In our previous study⁷⁾, the introduction of a straw was appropriate after an infant acquired the ability to sip liquid from a spoon and/or cup. Infants who began using a straw earlier than this required a long training time to functionally develop the ability to take in liquid using a spoon and/or cup. In addition, with the introduction of a cup it is often difficult at first for an infant to control one mouthful of liquid, and spillage or choking can occur. We focused on the spoon as an appropriate feeding device for transitioning smoothly and safely from the breast/bottle to cup feeding. One of the problems that arose with a standard spoon was confusion with regard to lip position. Confusion with regard to lip position led to the infant biting the spoon, which often happened when the bowl width did not match the lip width of the infant.

In 1927, Barton first reported an infant's feeding spoon¹⁾. It was designed to have a beak-like shape with which water would be poured more easily, and the bottom of the bowl has a depression (Fig. 1). In Japan, a *renge* spoon (the flat-bottomed Japanese soup spoon) is often used for feeding liquid to infants. However, there are few reports about the relation of feeding devices to the development and learning of oral function^{2,6,8,9,11)}. In the present study, we assessed the use of several feeding devices with new bowl forms

for the purpose of taking liquid, and focused especially on the form of the *renge* spoon. The aim of this study was to determine the appropriate spoon form for infant feeding development.

Materials and Methods

Eleven healthy infants (3 girls and 8 boys, 10–18 months old, mean age: 13.3 months) were recruited with their guardians' consent for this study. The age range of the infants was large so as to enable us to monitor acquisition of sipping function. We made 3 types of prototype spoon: type A, oval (a standard *renge* soup spoon); type B, flared-out (with the margin of the bowl flared out); and type C, hemispherical (with a hemispherical bottom, and smaller than type A or B). Figure 2 shows the details for each spoon.

We observed infants taking liquid supported by their mothers and evaluated the following responses: 1) confusion with regard to lip position, 2) spillage and 3) choking. In the correct position, the spoon is placed between the upper and lower lip. The spoon should be supported by the lower lip, with the surface of the water touching the upper lip. However, if the width of the mouth is insufficient to accommodate the spoon, problems will ensue with regard to lip position and the ability to intake liquid. If no such problems occur, then the infant will usually sip twice from each spoonful. In this study, spillage and

Fig. 2 Dimensions of 3 prototype spoons

We made 3 types of prototype spoon: A, oval (standard *renge* soup spoon); B, flared-out (with margin of bowl flared out); and C, hemispherical (with hemispherical bottom; smaller than type A or B). All dimensions are shown in millimeters.

choking were recorded, however, even if only one sip was taken.

1. Analysis

We statistically compared the infants' use of spoon types A, B and C in terms of confusion with regard to lip position, spillage and choking using the chi-square test (confidence level: $p < 0.05$).

Results

Type C elicited statistically less confusion with regard to lip position than types A or B ($p < 0.01$), and B less than A ($p < 0.05$). No statistically significant differences were observed in spillage or choking among the three types of spoon (Table 1).

Table 1 Infant feeding responses by spoon type

n = 11	Confusion of lip position (number of infant)	Spillage (number of infant)	Choking (number of infant)
Type A	7 *	7	1
Type B	4 **	7	1
Type C	1 *	6	1

*, $p < 0.05$, **, $p < 0.01$

Discussion

The technique by which infants eat changes from sucking milk to taking sips of liquid. In accordance with this development, the feeding devices used by infants also change from breast-feeding or bottles to spoons, straws and cups. The introduction of the spoon-feeding of thin, smooth, pureed food and liquids occurs once a child reaches about a 6-month level developmentally^{4,5)}.

In the present study, we made 3 types of prototype spoons for taking liquid, and observed infants' responses, particularly their exhibiting confusion with regard to lip position, spillage and choking. The results showed that, in terms of confusion with regard to lip position, the hemispherical spoon (type C) was the most appropriate form, and the flared-out spoon (type B) was more a appropriate form than the oval spoon (type A).

We concluded that there are three reasons why the hemispherical spoon (type C) effectively prevented infants from becoming confused with regard to lip position. First, it was possible to drink liquid from this spoon from any direction, which means that a mother can assist her infant in feeding from any direction. Second, the width of the bowl was appropriate for an infant's mouth size. In our previous study, the width of the spoon bowl was approximately 2/3 the width of the infant's mouth⁸⁾. Third, the size of the spoon was such that the amount of liquid that filled the spoon was suitable for one mouthful for an infant. To sip liquid, an infant's upper lip must touch the surface of the liquid. For this to occur, the spoon must be filled with a sufficient amount

of liquid. In contrast, in the oval (type A) and flared-out (type B) spoons, an amount of liquid suitable for one mouthful did not completely fill the spoons. Thus, the mother had to tilt the spoon and tip the infant's head back and chin up. This position caused infant's airway to open and created a high risk of aspiration. To avoid aspiration, the spoon should be completely filled with liquid.

The flared-out spoon (type B) caused less confusion with regard to lip position than did the oval spoon (type A). The lip fit of the flared margin was satisfactory because the upper lip easily touched the surface of the liquid and the lower lip easily touched the undersurface of the spoon. The flow of liquid from the spoon to the mouth also appeared to occur at an appropriate speed.

No statistically significant differences were observed for spillage or choking among the three types of spoon. However, improvements with regard to spillage or choking may occur more quickly as an infant grows with the use of the flared-out (type B) and hemispherical (type C) spoons compared with the oval spoon (type A) because they lead to less confusion with regard to lip position. A limitation of this study was that we could not assess the development over time of the infants' skill at taking in liquid. In the future, we should better assess whether these new spoons actually make the transition from spoon to cup go more smoothly over time.

It has been observed that impaired infants are often not able to transition from breast-feeding or bottle use to using a spoon. However, such infants need to acquire the ability to intake liquid, just as do healthy infants. The

hemispherical (type C) and flared-out (type B) spoons, which we assessed in this study, might support the ability of impaired infants to intake liquid safely. Morris reported that the treatment of children with swallowing dysfunction requires a holistic approach based on a global view of their problems and needs. The primary goal of such an approach is to develop the appropriate use of the mouth, respiratory, and phonatory systems through exploration, sound play, and as much oral feeding as possible¹⁰⁾.

The ability to take in liquid improved spectacularly in the infants in this study. In the course of this feeding development, they quickly acquired the ability to sip from a spoon, indicating that they would probably also learn to continuously swallow efficiently. In contrast, with the use of a cup it was difficult for infants in the initial growth phase to adjust the amount of one mouthful of liquid. The *renge* spoon has often been used as a way to transition smoothly from spoon to cup. The results of the present study, however, indicate that a hemispherically shaped feeding spoon is the most appropriate for infant feeding development.

References

- 1) Barton EA (1927) An infant's feeding spoon. *Lancet* 210:869.
- 2) Carruth BR, Skinner JD (2002) Feeding behaviors and other motor development in healthy children (2–24 months). *J Am Coll Nutr* 21:88–96.
- 3) Delaney AL, Arvedson JC (2008) Development of swallowing and feeding: prenatal through first year of life. *Dev Disabil Res Rev* 14:105–117.
- 4) Fomon SJ (2001) Feeding normal infants: rationale for recommendations. *J Am Diet Assoc* 101:1002–1005.
- 5) Fucile S, Gisel EG, Lau C (2002) Oral stimulation accelerates the transition from tube to oral feeding in pre-term infants. *J Pediatr* 141:230–236.
- 6) Ishida R, Kuramoto E, Kajinaga Y, Ishikawa A, Mukai Y (1998) A study of the appropriate spoon shape for infants in the weaning period. *Shoni-Hokenkenkyu* 57:829–834. (in Japanese)
- 7) Ishida R, Ohkubo M, Honda Y, Hosoya M, Kawata T, Shirai Y (2011) Selection of appropriate feeding implements for liquid intake in infant feeding development. *Pediatr Dent*. (in press)
- 8) Kuramoto E, Tamura F, Ohkubo M, Ishikawa H, Mukai Y (2002) Effect of spoon shape on lip function during self-feeding in infants ball width and grip length. *Shoni-Hokenkenkyu* 61:82–90. (in Japanese)
- 9) Malhotra N, Vishwambaran L, Sundaram KR, Narayanan I (1999) A controlled trial of alternative methods of oral feeding in neonates. *Early Hum Dev* 54:29–38.
- 10) Morris SE (1989) Development of oral-motor skills in the neurologically impaired child receiving non-oral feedings. *Dysphagia* 3: 135–154.
- 11) Pridham K, Steward D, Thoyre S, Brown R, Brown L (2007) Feeding skill performance in premature infants during the first year. *Early Hum Dev* 83:293–305.

Reprint requests to:

Dr. Ryo Ishida
Department of Dysphagia Rehabilitation
and Community Dental Care,
Tokyo Dental College,
1-2-2 Masago, Mihama-ku,
Chiba 261-8502, Japan
E-mail: rishida@tdc.ac.jp