Orthodontic Products Update

Impression Materials

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Abstract. *This paper incorporates a brief review of impression materials currently available for use by the orthodontic profession; subjective assessments of a selection of alginates, silicones and bite registration materials in a clinical setting; and a list of prices and retailers of impression materials.*

Uses of impression materials

The majority of impressions taken by orthodontists are used for pre- and post-treatment records of the dental arches. Alginate (irreversible hydrocolloid) is the most commonly used impression material. Silicone putty materials are often used when taking impressions of neonates with orofacial clefts and some clinicians advocate using silicone impression materials when taking impressions prior to planning orthognathic surgery, due to their greater stability and resistance to tearing. Elastomeric bite registration materials are commonly used in Restorative Dentistry to avoid displacements which can occur when a patient bites into a wax wafer. Mitchell (1994) described a technique of occlusal registration for functional appliances using elastomeric bite registration materials. It has proposed that transparent silicone impression materials (e.g. *Polysil Transbite*; SciCan, Optident Ltd.) may be useful when transferring orthodontic brackets using the indirect bonding technique. Impression compound is still in use by some operators when taking impressions of neonates with oral clefts.

Alginate (irreversible hydrocolloid)

Alginate impression materials were originally developed in the 1930s. The main advantages are that they are inexpensive and hydrophilic (contact angle 37°), which means that they will displace blood and saliva and pour well with gypsum stones. However, alginates have a low tear strength. They tend to have poorer reproduction of surface detail and are not as dimensionally accurate as the medium and light bodied silicone materials. Alginates are not dimensionally stable on storage due to syneresis and are usually best poured immediately. Zhermack advertise that their alginate impressions can be kept up to 48 hours (prior to casting) in their 'long life' hermetically sealed bags. PSP Dental claim that their triethanolamine modified alginates (*Ortho Algin* and *Empress*) are more stable than conventional alginates.

Chemistry

Calcium alginate is a hydrophilic elastic gel formed when a dry powder of a soluble salt of alginic acid and a slowly soluble calcium salt are mixed with water. Alginic acid, which may be in the form of sodium, potassium or ammonium salts, is a polysaccharide derived from seaweed. The outer layer of each alginic acid particle dissolves and reacts with calcium ions released from the calcium salt (e.g. $CaSO_4$). The reaction is delayed by the inclusion of trisodium phosphate which reacts with the Ca^{++} ions, to give $Ca_3(PO_4)_2$ enabling the manufacturer to control the setting time. Calcium ions react preferentially with the phosphate and calcium alginate will not be produced until the trisodium phosphate is used up. Fillers, e.g. diatomaceous earth (skeletons of diatoms, small algal cells with walls of silica from sea water deposits) or silicates, increase the strength of the mix and cohesion of the gel. Bayer Dental claim to have discovered a rounded form of diatom in fresh water which gives a finer grain structure to the impression material.

Fluorides or silico-fluorides can be added to improve the surface of the stone model (e.g. Hexa Fluoro Titanate in *Alginoplast* and *Xantalgin*, Bayer Dental).

Some manufacturers include a colour pH change to indicate different stages of manipulation e.g. violet colour during spatulation, pink when loaded into the tray and white when ready to load into the mouth (*Kromopan 100*, Lascod; *Kromoge*l, Wrights).

The setting time of calcium alginate is very temperature dependent, cold retards and warm hastens the set. At least one manufacturer also makes an accelerator to enable the clinician to further control the setting time (*Palgaflex*, ESPE) and Zhermack manufacture a 'retarder' to slow the set. PSP Dental produce a special alginate for use in tropical climates.

Due to the instability of alginate materials in some disinfecting solutions, one manufacturer has incorporated Chlorhexidine into the alginate powder in an attempt to limit cross infection (*Hydrogum plus Chlorhexidine*, Zhermack). However, although Chlorhexidine acetate is bactericidal to a wide range of Gram-positive and Gram-negative organisms and has some activity against yeasts such as Candida and other fungi, it does not inactivate viruses such as Hepatitis B virus or human immunodeficiency virus (HIV), which may be transmitted in saliva or blood.

Several manufacturers have added mint or vanilla flavours to their alginates (e.g. *Blend-a-Print*, Crest; *Xantalgin*, Bayer; *Orthoprint*, Zhermack; *Formula-1* Orthocare) and various flavoured drops can be added at the time of mixing (available from TOC, Orthocare and the

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Dental Directory). Zhermack advertise that their vanilla flavoured *Orthoprint* is 'anti-nausea'.

Silicone impression materials

Silicone impression materials are much more stable than alginates and can be poured 48 hours or more after impression taking.

There are two types of silicone impressions materials – *condensation cured* and *addition cured.*

Condensation cured silicones

These are also known as polysiloxanes as they have alternating atoms of oxygen and silicone. Condensation cured silicones are all two component systems with a base paste containing the silicone polymer plus filler and a reactor (or accelerator) paste containing a cross linking agent (alkoxy ortho-silicate or organohydrogen siloxane) plus an activator (organo-tin compound e.g. dibutyl-tin dilaurate).

Setting occurs by cross linking between the terminal hydroxy groups on the silicone polymer molecules and either the alkoxy ortho-silicate which produces alcohol as a by product or the organo-hydrogen siloxane which produces hydrogen. Evaporation of the alcohol can lead to dimensional instability and production of hydrogen can lead to pitting of dental stone surfaces.

The amount of filler determines the viscosity. The 'putty' materials which may be used for taking impressions of neonates are of type 0, very high consistency. The high proportion of filler material reduces the dimensional changes which may occur during setting.

Condensation cure silicones are very hydrophobic, having a contact angle between 81° and 88°, the use of a surfactant can improve surface detail when pouring with gypsum stones.

The condensation cure silicone putty materials are generally presented as a base putty to which a small volume of catalyst (accelerator or indurent) is added in the form of a liquid or paste. In my experience mixing is easier using a paste than a liquid.

Zhermack advertise that their condensation cured silicone putty *Orthogum* (bubble gum flavoured!) has high elasticity and has been specially designed for use in orthodontics.

Addition reaction silicones

These are more accurate and stable than the condensation cured silicones as they do not release any by-products on setting. They are also known as polyvinylsiloxanes, (PVS) or vinyl polysiloxanes, as the setting reaction is between the terminal hydrogen atoms on organo-hydrogen siloxane molecules in one paste and terminal vinyl (CH_2=CH~) groups on the silane in the other, in the presence of a precious metal catalyst (H_2PtCl_6). The addition cured silicones form a more highly cross-linked material than the condensation cured, with improved recovery from deformation.

Addition cured silicones are the most accurate of all impression materials, they have the lowest distortion and are dimensionally stable out of the mouth for up to seven days if kept dry.

Hydrogen gas may be released from a side reaction not related to curing. Check the manufacturers recommendations, they may advise waiting at least one hour before pouring to avoid in bubbles in the model.

As with most silicones they are hydrophobic with contact angles around 80°–100°, however hydrophilic versions are available with improved wetability (e.g. *Provil hydroactiv*, Bayer).

Addition cured silicones are generally presented as two putties that are blended together by hand. Mixing is usually easier and cleaner than condensation cure putties. Sulphur, used to cure latex and found in the surface powders of gloves, inhibits the set of many addition reaction silicones. If mixing putty by hand, latex gloves should be removed or vinyl gloves worn. A recent introduction is the Pentamix Automatic Mixing Machine (ESPE) which can be used to mix specially prepared silicone putty. Alternatively, Parkell have produced '*Cinch automix putty*' (see clinical assessment below) which is mixed and dispensed using a conventional cartridge gun. The manufacturers claim that it is highly viscous and as hard as conventional vinyl polysiloxane (addition cured) putty, i.e. 70 durometer.

The setting time of silicones is temperature dependent; storing the materials in the refrigerator can increase working time by a quarter. The longevity of the material is also dependant upon storage temperature. The manufacturers instructions should be referred to, but they often state that silicone impression materials should be stored between 15° and 23°C. The shelf life of these materials is relatively short and they generally should not be stored for more than one or two years (check 'use by date' on the packaging).

Special, extra hard addition cured silicones have been developed for use as bite registration materials. These are dispensed in gun or cartridge delivery systems (e.g. *Blu Mousse*, Parkell; *Memosil*, Heraeus Kulzer).

Silicones tend not to adhere to impression trays very well and the use of an appropriate adhesive is recommended.

The addition cured silicones should not be used in any combination techniques with a condensation cured silicone.

Both types of silicone impression material are expensive compared to alginate. Addition cured silicones are more expensive than condensation cured, while cartridge delivery systems and bite registration materials are the most expensive.

Impression compound

Impression compound is a mixture of natural resins (e.g. shellac, colophony, waxes), fillers (e.g. talc) and lubricants (e.g. stearic acid). It is thermoplastic, i.e. it softens when heated and hardens when cooled . The type I (low fusing) compound is used for taking impressions of edentulous patients. The compound should be heated to around 55–60° in a water bath, lined with a napkin. It exhibits shrinkage on cooling (about 1·5%) less than or equal to alginate.

Impression compound is useful for taking impressions of

Common terminology used in impression materials science

Condensation reaction A reaction between two molecules to form a larger molecule with elimination of a smaller molecule (e.g. alcohol or water)
Contact angle The contact angle between a drop of water and the surface of a material is used to measure wetability. The lower the angle the more hydrophilic the material and the better an impression material will flow across a wet surface.
Hydrophilic Having strongly polar groups which readily interact with water
Hydrophobic Lacking polar groups and thus insoluble in water
Syneresis The drawing together of particles in a gel, with expulsion of the liquid, leading to shrinkage.
Thixotrophy A temporary reduction in viscosity under pressure.

neonates as it does not tear and can be removed before fully set in cases of emergency. The use of a water bath creates problems with sterility in these highly vulnerable babies and some operators have abandoned them in favour of boiled water. Care should be taken, as overheating is easy and can burn the child, in addition to leaching out the more volatile components of the compound.

CLINICAL ASSESSMENTS OF A SELECTION OF IMPRESSION MATERIALS

Materials

Purveyors of impression materials were approached in late 1996 and early 1997 and asked if they would like to provide currently available materials for clinical assessment. We were provided with fifteen alginates, thirteen silicones and three bite registration materials to test (Table 1).

Methods

Impression of the fully dentate lower arch

The clinical handling of all the impression materials was assessed by five different clinicians (three consultant orthodontists, one senior registrar and one registrar), five orthodontic dental nurses and five volunteer members of the orthodontic departments who acted as 'subjects'. Repeated impressions were taken of each volunteer's lower dental arch by one clinician/nurse pair using all of the materials except the bite registration materials (total 140 impressions). The materials were used in a different, random order by each pair. All of the impression materials were used 'blind', the materials having been either removed from their original containers or in the case of the cartridge delivery systems, the names were covered in white paper. The manufacturers instructions on mixing were followed (i.e. volumes, length of mixing time). The water for the alginate impression materials was standardised at 23°C, room temperature was also coincidentally 23°C. '*Tra-tens*' perforated plastic impressions trays (Orthocare) were used with 'Fix' liquid adhesive (Dentsply) for the alginate impressions and Kerr adhesive for the silicones. The alginate impression materials were cast immediately in Kaffir D, the silicone materials after 1 hour in white dental stone. One set of impressions, using each material, was recast three times.

Clinical parameters measured

1. Patient acceptability was recorded using a horizontal 10cm visual analogue scale. The left extremity was labelled 'poor' and the right extremity was labelled 'excellent'. The patient was asked to mark along the line taking into account taste, texture, ease (or otherwise) of removal, aftertaste and residue in mouth.
2. Ease of mixing was recorded by the dental nurses using similar visual analogue scales.
3. Consistency was recorded separately by both the clinician and dental nurse using visual analogue scales as above.
4. The setting time was measured in seconds from start of

TABLE 1. List of impression materials used for assessment of clinical handling. For each of the silicones the 'soft, fast' version was used where available.

Alginates	Silicones	Bite Registration materials
Alginoplast (Bayer)	**Condensation cured**	Blu-Mousse (Parkell)
Aroma Fine (G.C.)	Condensil ((Septodont)	Occlufast (Zhermack)
Blend-a-Print (Crest)	Optosil (Bayer)	Stat-BR (Kerr)
Blueprint Cremix (Dentsply)	Orthogum (Zhermack)	
Fidelity (Schottlander)	**Addition cured putty**	
Formula-1 (Ortho-care)	Elite H-D (Zhermack)	
Hydrogum (Zhermack)	Express (3M)	
Ideal (GAC)	Extrude XP (Kerr)	
Kent Dental	Perfexil (Septodont)	
Kromopan 100 (Lascod)	President (Coltène)	
Orthoalgenat (Dentaurum)	Schottlander Doric	
Orthoprint (Zhermack)	**Cartridge delivery**	
PSP Ortho Algin	Cinch (Parkell)	
Rapide 105 (Wright)	Extrude extra (Kerr)	
Xantalgin (Bayer)	Extrude MPV (Kerr)	
	Imprint (3M)	

mix to removal from the mouth (judged clinically when a thumb nail no longer left a permanent imprint in the impression).

One of the volunteers had brackets bonded onto the six lower incisors, notes were taken as to whether any particular problems were encountered on removal of the impressions.

The remainder of the alginate samples were then used in routine clinical impression taking, in the hospital orthodontic departments and any problems were noted.

Laboratory handling

Three technicians each cast at least one set of all the impressions. They were asked to give their assessments of ease of pouring, surface detail and quality of model surface using visual analogue scales. They also made comments on any problems encountered. Measurements were made on the models, by one operator, of the width of the lower right incisor, distance between distal surfaces of the lower canines and the distance from the midline to the mesial surface of the lower right first molar, using a vernier gauge with 0·1mm gradations. Corresponding measurements were taken directly in the mouths of the subjects.

Impression of a neonatal cleft upper arch

As repeated impressions could not be taken of a neonate with an oro-facial cleft, this technique was simulated in the laboratory. A jig was constructed to enable impressions to be taken of a wet, soaped stone model. A constant force of one Newton was applied, using a volume of 4mls of impression material. A suitably sized acrylic tray was used, selected from a range made in our laboratory for clinical use, together with the appropriate adhesive. The model was of a neonate with a cleft of the hard palate. Two extra holes had been drilled through the model in the midline anterior palatal region to simulate fistulae. The holes were both 7mm deep with diameters of 1·5mm and 5mm. After removal of the impression from the model, the length of the material extruded into or through the holes was measured and its shape noted.

Bite Registration Materials

Three dedicated bite registration materials were tested *Blu- Mousse* (Parkell), *Occlufast* (Zhermack) and *Stat-BR* (Kerr). These were compared with three heavy bodied, cartridge delivered, addition cured silicone impression materials *Imprint II* (Kerr), *Extrude MPV and Extrude extra* (Kerr).

Protrusive bite records were taken on two occasions, of a volunteer with a class II division 1 malocclusion using each of the above materials together with *Projet jigs* (Orthocare), following the method described by Mitchell (1994). The time taken for each material to set was recorded, together with the comments made by the two clinicians (consultant orthodontists) and the subject (orthodontic senior registrar) on the clinical handling and patient acceptability.

Upper and lower study models were located into the protrusive bite records. The reproducibility of the records were assessed by measuring the relationship between horizontal and vertical lines carved into the sides of the model bases. The stability of the bite records was assessed by repeating the measurements 6 months later.

Results

Impression of the fully dentate lower arch

The visual analogue scales were measured and the data were converted to percentage scores. The median value for each clinical parameter was calculated for each impression material and the results are shown in a series of histograms (Figures 1–10).

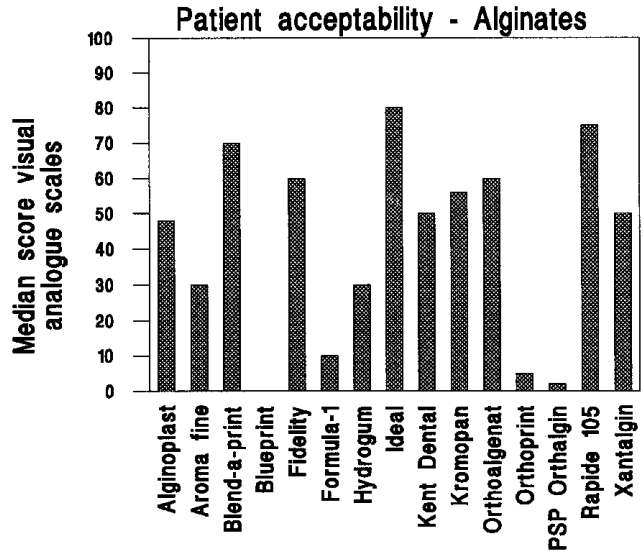

FIG. 1 Histogram showing the median scores of patient acceptability of the different alginates under test. The scores were recorded using visual analogue scales.

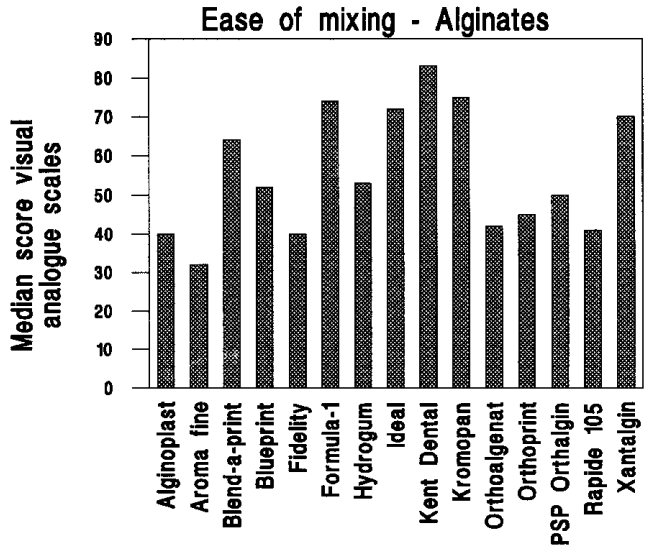

FIG. 2 Histogram showing the median scores for ease of mixing of the different alginates under test. The scores were recorded by the dental nurses using visual analogue scales.

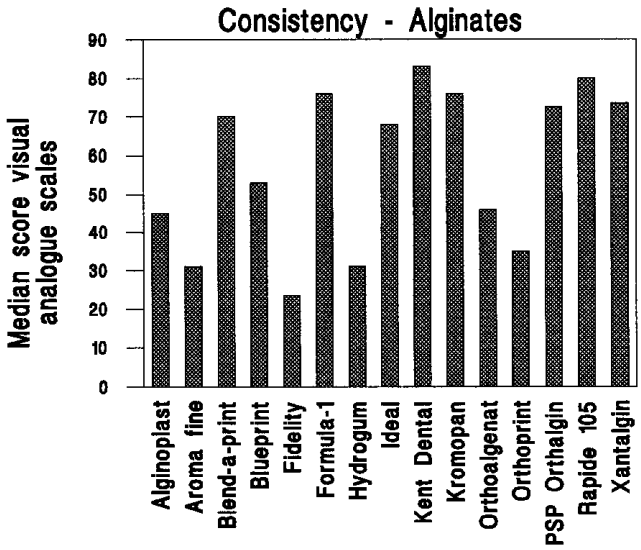

FIG. 3 Histogram showing the median scores of the consistency for the different alginates under test. The scores were recorded by both the clinician and the dental nurse using visual analogue scales.

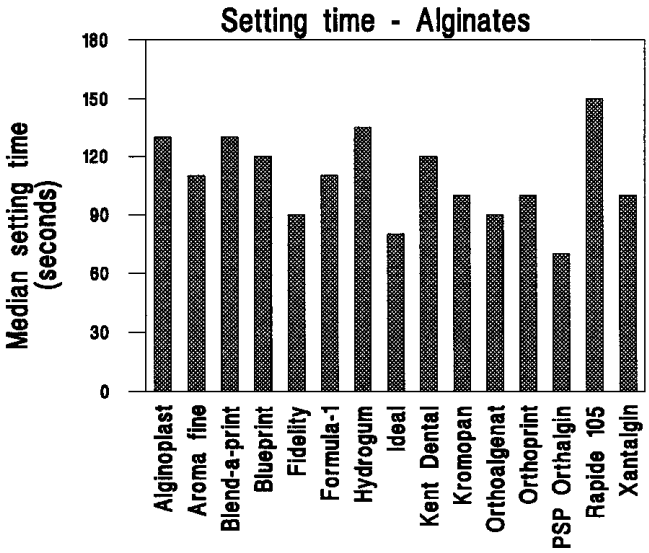

FIG. 4 Histogram showing the median time from start of mix to removal from mouth of the different alginates under test.

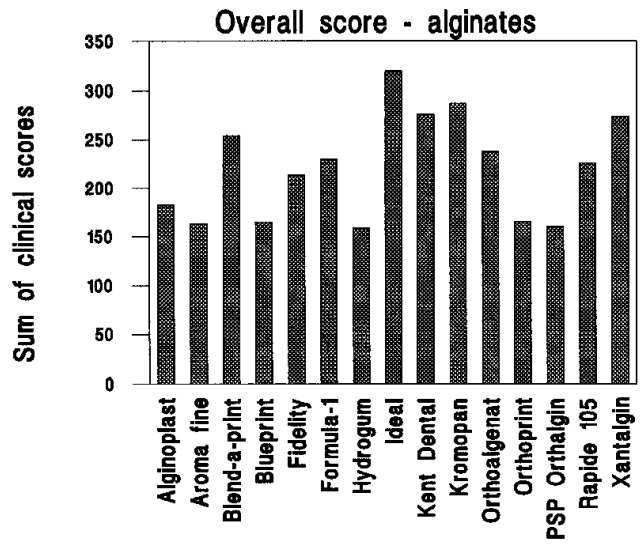

FIG. 5 Histogram showing the overall clinical scores for the different alginates under test. The overall scores are the sum of the scores for patient acceptability; consistency and ease of mixing. A score was also added for setting time by subtracting the number of seconds for set from 180 seconds (three minutes), thus an alginate which took 150 seconds to set had a score for that component of 30.

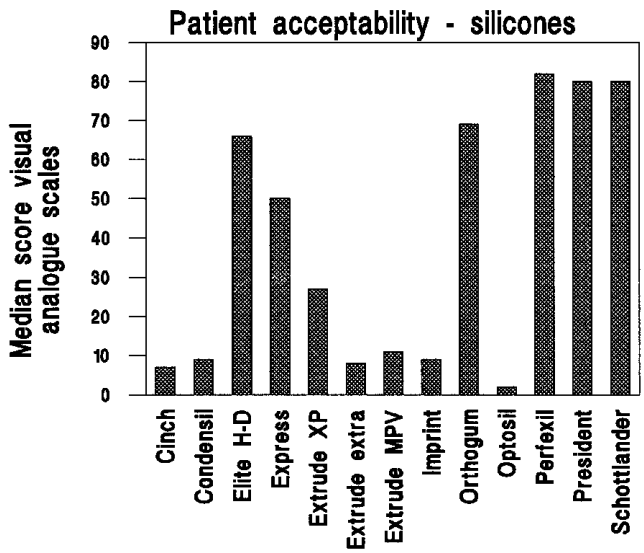

FIG. 6 Histogram showing the median scores of patient acceptability for the different silicone impression materials under test. The scores were recorded using visual analogue scales.

Routine use in the orthodontic clinics

Most of the alginates proved to be satisfactory in general clinical usage apart from *Formula-1* (Orthocare). We had problems with both the blue original and the yellow, supposedly, vanilla flavoured versions. They both tended to drag in the mouth and pulled away from the tray, even using the multiperforated '*Tra-tens*' trays (Orthocare) with adhesive. Several appliances had to be remade. The smell and the flavour of the 'vanilla' version were most unpleasant. We approached Orthocare about these problems, they were sympathetic and provided a new batch of alginate which has proved satisfactory.

Laboratory reports

The technicians reported no problems pouring any of the impressions for single models. The model surfaces were all very good (all $> 70\%$ on the visual analogue scales) with little discernible difference between any of the materials. Reproduction of surface detail was good for all of the algi-

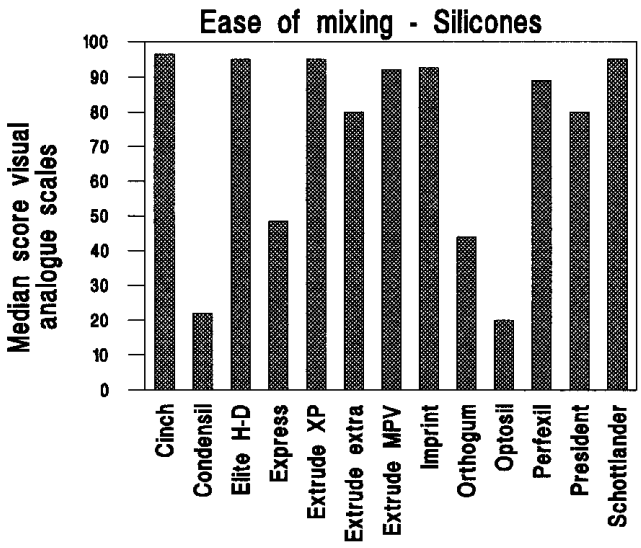

FIG. 7 Histogram showing the median scores for ease of mixing of the different silicone impression materials under test. The scores were recorded by the dental nurses using visual analogue scales.

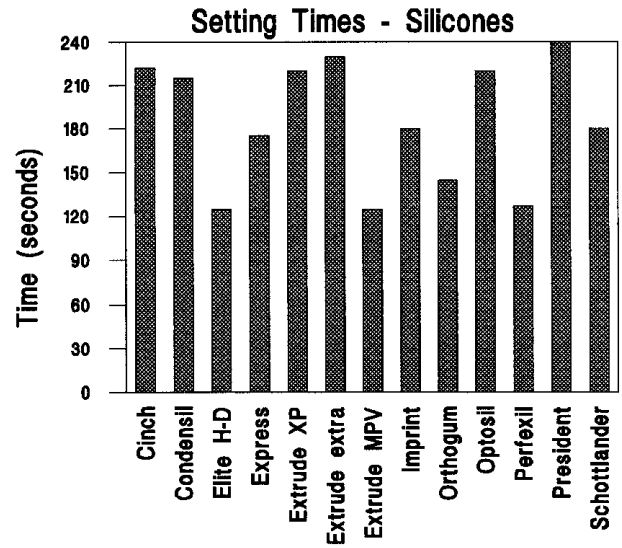

FIG. 9 Histogram showing the median time from start of mix to removal from mouth of the different silicone impression materials under test.

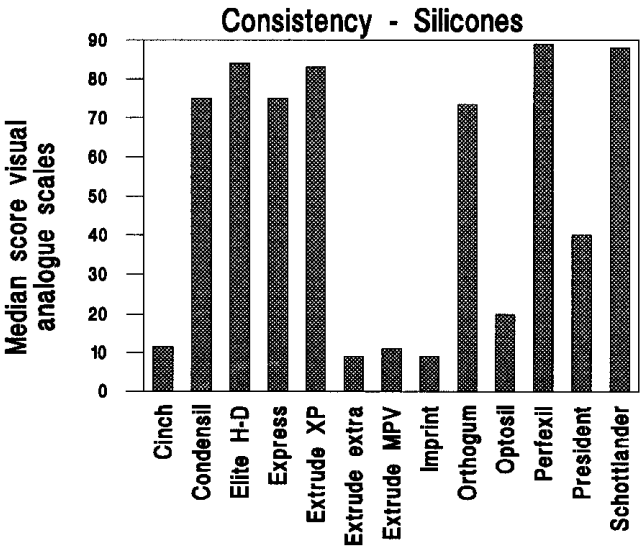

FIG. 8 Histogram showing the median scores of the consistency for the different silicone impression materials under test. The scores were recorded by both the clinician and the dental nurse using visual analogue scales.

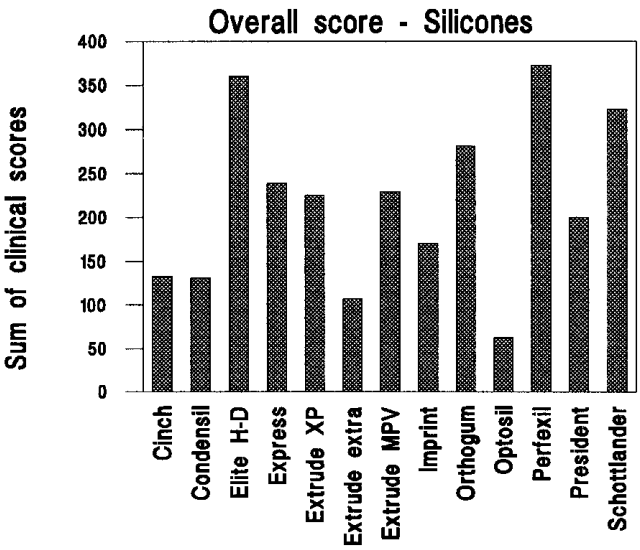

FIG. 10 Histogram showing the overall clinical scores for the different silicone impression materials under test. The overall scores are the sum of the scores for patient acceptability; consistency and ease of mixing. A score was also added for setting time by subtracting the number of seconds for set from 240 seconds (four minutes), thus a silicone which took 210 seconds (3_minutes) to set had a score for that component of 30.

nates, with clear outlines of all gingival margins and amalgam restorations. The silicones generally had good detail on the occlusal surfaces but, not surprisingly, poor reproduction of the gingival third of the teeth (particularly the lower incisors) where the materials did not flow into the undercuts. The cartridge delivered materials were slightly, but not markedly, better than the putties and still fell far short of the detail produced by the alginates.

The dimensions of the models were remarkably similar to the measurements taken directly in the mouth. The maximum change for both alginates and silicones was 1·6% with 74·6% of the models having no measurable dimensional error (using vernier gauge with 0·1mm gradations). No particular material was consistently worse or better.

Multiple castings of alginates

We were able to pour three casts from all of the alginate materials. *Blend-a-print, Blueprint* and *Xantalgin* tended to pull away from the trays. *Fidelity* and *Hydrogum* both tore. *Blend-a-print* left a green film on the surface of the

models (both Kaffir D and white dental stone). The maximum dimensional change measured was 4·5% (*Blend-a-print*), affecting the lower canine width. Only one alginate, *Alginoplast*, showed no measurable dimensional change in any direction. The majority of the others showed changes in at least one dimension of between 1·25 and 1·7%.

There was almost no loss of surface detail visible (using a ×4 magnifying glass) between the first and second casting with slight loss of detail of the gingival margins on the third casting for all materials. *Alginoplast, Fidelity, Ideal* and *Xantalgin* performed the best.

Impressions of brackets bonded to lower incisors

All of the alginates were removed from the mouth with ease and produced good impressions with no tearing. None of the silicone materials flowed well around the brackets and poor impressions were taken of the labial surfaces of the incisors. In spite of this several of the putty materials were difficult to remove from the mouth (*Perfexil, Express, Elite* and *Extrude*) although none actually pulled any brackets off. The cartridge delivered silicone materials did not cause any problems with removal.

Impression of a model of neonatal cleft upper arch

All of the alginate impression materials and cartridge delivery silicones used provided good replication of the surface detail on the model, except *PSP Ortho Algin* which had a rough surface. The silicone putties had slightly poorer surface detail, although all the rugae were still clearly distinguishable. The bite registration materials (which had been syringed into the impression tray) had the poorest surface detail with several air blows. They were also the most difficult to remove as they set very hard—the *Blu-Mousse* impression fractured at the undercut around the buccal sulcus. The alginates tended to extrude the furthest through the simulated fistulae (Table 2), where three formed mushroom shapes which tore away on removal of the impression from the model. *PSP Ortho Algin* penetrated the least, but had a poor surface. The putty materials tended to perform best, penetrating less and forming cylinders through the 'fistulae, which were easily removed from the model without tearing. The cartridge delivery silicones were all too fluid, flowing easily through the small and large fistulae and forming tuberosities.

Bite Registration Materials (Table 3)

All of the materials provided good protrusive records. Study models were easily located into all of the records with remarkable replication between the different 'bites'. In the horizontal direction there was no clinically measurable difference between the materials (measurement error of $<0{\cdot}25$ mm, using a vernier gauge with 0·1mm gradations). In the vertical direction, the dedicated bite registration materials performed best as they set hard. The heavy bodied impression materials (*Extrude MPV, Extrude extra* and *Imprint II*) all remained slightly rubbery (flexible) when set which allowed a certain amount of 'bounce' between the upper and lower study models. The error produced was small but clinically detectable (1–1·5mm).

TABLE 2 Results from analysis of impressions of the neonatal cleft palate cast, showing details of the length of material which extruded into the simulated fistulae.

Name of material	Shape of extrusion through 'fistula'	Length of extrusion into 1·5mm 'fistula'	Length of extrusion into 5mm 'fistula'
Alginates			
Alginoplast	Mushroom (tore)	4·2mm	12·2mm
Blend-a-print	Straight cylinder	3·1mm	15·5mm
Fidelity	Straight cylinder	3·5mm	5·2mm
Ideal	Straight cylinder	5·3mm	9·3mm
Orthoprint	Mushroom (tore)	5·6mm	25·2mm
PSP Ortho Algin	Straight cylinder	1·1mm	2·3mm
Xantalgin	Mushroom (tore)	5·4mm	25·6mm
Condensation cure putty			
Condensil	Straight cylinder	2·1mm	6·6mm
Orthogum	Straight cylinder	1·8mm	4·9mm
Addition cured putty			
Elite	Straight cylinder	1·2mm	3·6mm
Express	Straight cylinder	2·4mm	6·1mm
Extrude	Straight cylinder	1·2mm	4·2mm
Perfexil	Straight cylinder	2·2mm	4·2mm
President	Straight cylinder	2·7mm	6·6mm
Schottlander Doric	Straight cylinder	2·5mm	5·4mm
Cartridge delivery			
Cinch	Tuberose	4·8mm	8·4mm
Extrude extra	Tuberose	5·4mm	12·1mm
Extrude MPV	Tuberose	6·4mm	15·1mm
Imprint	Tuberose	5·6mm	10·8mm
Bite registration materials			
Blu-Mousse	Air blow	3·2mm	3·2mm
Occlufast	Tuberose	4·2mm	7·7mm
Stat-BR	Air blow	1·8mm	-

TABLE 3 Results of clinical assessments of bite registration materials. The first three materials are dedicated bite registration materials, the others are heavy bodied, addition cured silicones.

Material	Setting time in seconds	Clinical handling
Blu-Mousse	30	Easy to use. Fluid, flowed well interdentally. Pleasant taste
Occlufast	85	Took up space well. Very stiff, needed some strength to squeeze cartridge gun. Pleasant taste.
Stat-BR	40	Reasonable consistency, came away cleanly from the nozzle. Flavour OK.
Extrude MPV	130	Nice to use. Good impression, good consistency, flowed well, but was a bit stringy when the gun was withdrawn. Slightly chemical taste.
Extrude extra	180	Good impression, flowed well, slightly oily. Greasy taste.
Imprint II	120	Good impression, but very runny. Tasted horrid!

All the materials except *Stat-BR* were stable at six months, allowing accurate repositioning of the study models with no measurable distortion. The *Stat-BR* record was usable, although the material had started to deteriorate and a segment fractured and separated during relocation of the models.

Conclusions:

Impressions of dentate arches

From these trials, bearing in mind that all of the alginate material were cast immediately, there seems to be no benefit using putty or heavy bodied silicone impression materials in a monophase system for orthodontic impressions of dentate arches.

Comparing the clinical handling of the alginates we tested, *Ideal* (GAC) performed best overall, with *Kromopan* (Lascod), *Kent Dental* (own brand), *Xantalgin* (Bayer) and *Blend-a-print* (Crest) also scoring highly. Our adult subjects in the trials preferred alginates with a slight minty taste, although vanilla was popular with the youngsters when we used the materials in the general clinics.

Impressions of neonates with orofacial clefts

We had hoped that the cartridge (gun) delivery systems of silicone impression materials might prove useful for taking impressions of neonates, as mixing is so much easier and reduced handling could reduce the chances of cross infection. However, all the cartridge delivered silicones we tried were too fluid for use in neonates. The best results, with least flow into the simulated 'fistulae', were obtained with the silicone putty materials. The top scores for clinical handling went to *Perfexil* (Septodont), *Elite H-D* (Zhermack), and *Schottlander Doric*. These are all addition cured silicones, the condensation cured silicones tended to be messier and more difficult to mix.

Bite registration

All of the materials under test were easy to use (although *Occlufast* required a strong hand) and produced excellent, reproducible protrusive bite records, into which study models were easily located. The dedicated bite registration materials were superior in that they set faster and harder than the heavy bodied impression materials, with *Blu-mousse* setting the fastest.

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Company name	*Telephone no.*	*Company name*	*Telephone no.*
3M Dental	0150 9611611	Kerr UK Ltd	0161 7479728
Davis Schottlander & Davis Ltd	01462 48048	Orthocare	01274 392017
Deproco UK Ltd	01622 695520	Prestige Dental	01274 721567
Firmadenta	01787 379947	PSP Dental Co Ltd	0181 3117337
G.C. United UK Ltd	01908 218999	The Orthodontic Co.	0117 975 5533
Heraeus Kulzer	01635 30500		

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