牙體復形學 Operative dentistry

Nomenclature and Instrumentation
Rotating Instruments

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學習目標

- 期許同學在瞭解病患的需求及材料的特性後，能依據所學善加利用，做到不僅是幫病患解決病痛的牙醫師，同時也是個讓病患永遠也忘不了的藝術家．

1. 牙齒的生理，解剖形態
2. 齲齒的生理，診斷及治療計劃
3. 窩洞的修形及材料的選擇
4. 窩洞的充填方式及其修飾
5. 美觀性材料的選擇及其運用
6. 變色牙的修飾

參考資料

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2. Fundamental of operative dentistry. A contemporary approach 3rd edition, James B. Summitt.

Summary

Operative dentistry is the basic science in clinical dental practices.It included dental physiology,morphology,cariology,tooth preparation for restoration.The purpose of Operative dentistry is to complete the function and create the aethestic outlook.

Handpieces

In dentistry, two basic types of handpiece, the straight handpiece (Fig 6-60) and the contra-angle handpiece (Fig 6-61), are used. In the straight handpiece, the long axis of the bur is the same as the long axis of the hand-piece. The straight handpiece is used more frequently for laboratory work but is occasionally useful clinically.

Handpieces

The primary handpiece used in the mouth is the contra-angle handpiece. As with hand instruments, contra-angle indicates that the head of the handpiece is angled first away from, and then back toward, the long axis of the handle. Also as with hand instruments, this contra-angle design is intended to bring the working point (the head of the bur) to within a few millimeters of the long axis of the handle of the contra-angle handpiece to provide balance. Without balance, the handpiece would be unstable and could rotate in the hand with any application of pressure at the working point.

Handpieces

There are two types of contra-angle handpieces, which are classified by their speed potential. Low-speed contra-angle handpieces have a typical free-running speed range of 500 to 15,000 rpm; some are able to slow to 200 rpm, and others are able to achieve speeds of 35,000 rpm. High-speed handpieces have a free-running speed range greater than 160,000 rpm, and some handpieces attain free-running speeds up to 500,000. In the United States, dentists are accustomed to air-turbine high-speed handpieces; their speeds during tooth preparation are significantly less than their free-running speeds. In Europe, some hand-pieces powered by an electric motor can achieve free-running speeds of only around 165,000 rpm, but these handpieces are electronically regulated to maintain speed during tooth preparation.

Handpieces

High-speed techniques are generally preferred for cutting enamel and dentin. Penetration through enamel and extension of the cavity outline are more efficient at high speed. Small-diameter burs should be used in the high-speed handpiece. High speed generates considerable heat, even with small-diameter burs, and should be used with water coolants and high-efficiency evacuation. For refining preparations, a high-speed handpiece may be slowed considerably and used with only air coolant and a gentle brushing or painting motion in which each application of the bur to the tooth is brief. This technique allows visualization and prevents overheating.

Handpieces

Low-speed contra-angle handpieces, with round burs rotating very slowly, are used for removal of carious dentin. There are two types of contra-angle heads for the low-speed handpiece, a friction-grip head and a latch-type head. The shanks of the burs that fit into each of these types of contra-angle head are shown in Fig 6-62. The high-speed handpiece will receive only the friction-grip bur.

Burs

Hand-rotated dental instruments are known to have been used since the early 1700s. The foot engine came into use in dentistry in 1871 and the electric engine in 1872. The most significant advance, which has made present-day high-speed cutting possible, is the tungsten carbide bur, which became available in 1947. Burs have three major parts, the head, the neck, and the shank (Fig 6-63). For the different types of handpieces or handpiece heads, there are burs with different designs and dimensions (Fig 6-62).

Burs

The head of a bur is the portion of the bur that cuts. The cutting action is produced by blades on the head, and the blades are produced by cuts made into the head. The blades of a bur are usually obtuse to increase the strength and longevity of the bur. A cross section of a typical six-bladed bur is shown in Fig 6-64; the names of the faces and angles of the blades are also shown. The bur in Fig 6-64 has a negative rake angle, as do most burs used in dentistry, The negative rake angle increases the life expectancy of the bur and provides for the most effective performance in low- and high-speed ranges.

Burs

A positive rake angle would produce a more acute angle on the edge of the blade (edge angle). Positive rake angles may be used to cut softer, weaker substances, such as soft carious dentin. If a blade with a positive rake angle were used to cut a hard material, such as sound enamel or dentin, it would dig in, leaving an irregularly cut surface, and the cutting edges of the blades would chip and dull rapidly.

Burs

The basic shapes of dental burs used in operative dentistry are shown in Fig 6-65. Many other shapes are available; most are modifications of these five. Numbering systems have been introduced to describe the shapes of dental burs. The original system, introduced by SS White Dental Manufacturing Company, had nine shapes based on the burs available at that time. That system has been modified and expanded as new burs have been developed. The American National Standards Institute/American Dental Association (ANSI/ADA) specification provides standard characteristics for dental burs; this specification lists both the US numbers and the International Standards Organization (ISO) numbers for dental burs.

Burs

Prior to the advent of high-speed handpieces, it was found that additional cuts across the blades of a dental bur increased cutting efficiency; these cuts were called crosscuts. Today, with high-speed handpieces, crosscut burs are not normally of any benefit.

Burs

Table 6-1 shows diagrams, US bur sizes, and the head diameters of many available regular carbide burs. international Standards Organization sizes for each type of bur can be calculated from the diameter: A bur with a diameter of 0.8 mm will have an ISO size of 008; a diameter of 1.0 mm will have an ISO size of 010. The ISO sizes are combined with the shape of the bur, so an ISO inverted cone 006 is an inverted cone bur with a 0.6-mm major diameter; from Table 6-1, it can be determined that an ISO inverted cone 006 corresponds with a US No. 331/2 bur.

Burs

Another type of bur that is very useful in operative dentistry is the 12-bladed trimming and finishing bur (Table 6-2). These burs are excellent for making very smooth cuts in tooth preparations, adjusting occlusion in enamel or of a restoration, and finishing restorations. Thirty-bladed trimming and finishing burs create an even smoother cut than the 12-bladed burs and are available in a variety of shapes and sizes.

Burs

It is useful to know the diameters and lengths of the burs used in operative procedures so that they can be used as gauges of depth and distance. Bur head lengths may vary from manufacturer to manufacturer, so it is best to measure the individual burs being used and to use their dimensions as references for measuring preparation dimensions.

Burs

Diamonds. Used increasingly in operative dentistry, diamond burs are especially useful for preparations for bonded restorations. Several manufacturers produce diamonds that mimic the shapes of many of the carbide burs. Diamond burs cut tooth structure well and are acceptable substitutes for carbide burs, but many of the smaller sizes are not yet available as diamond burs.

Air-Abrasion Technology

In the 1940s, an instrument called the Airdent (SS White) was introduced as a means of cavity preparation. Because all restorations placed at that time depended on cavity preparation shape for retention, and as the Airdent did not prepare undercuts in preparations, the technology soon lost favor. When it was reintroduced in the 1980s, it received a greater degree of acceptance because bonded restorations had become routine, Etched enamel and dentin, rather than the shape of the cavity preparation, give retention to many restorations. A large number of air-abrasion units are being marketed for opening of fissures, for some cavity preparations, and to facilitate repair of existing restorations with bonding technology (Figs 6-66a to 66c).

Magnifiers

The quality, and therefore the serviceability and longevity of dental restorations, is dependent on the ability of the operator to see what he or she is doing. One of the primary advantages of the rubber dam in operative dentistry is improvement of the visualization of the operating field. Most current contra-angle handpieces have fiberoptic systems by which lights are placed in the contra-angle heads to improve visualization of the operating field.

Magnifiers

Magnification devices are extremely helpful in restorative procedures, and some form of magnification is recommended for every dentist providing restorative dentistry services. Available magnification devices run the gamut of effectiveness and expense. Among the finest magnifiers are the telescopes (Figs 6-67a to 6-67c), which are the most expensive. Less expensive loupes are available from several manufacturers (Figs 6-68a to 6-68c). In choosing a magnification device, the operator is wise to select one that gives a focal distance in the range of 10 to 14 inches. The 2.0- to 4.0-diopter range is recommended.

Magnifiers

A compact assembly of hand instruments that will satisfy most operators' needs during any amalgam, resin composite, glass ionomer, ceramic, or cast-gold restorative procedure is presented here. Dental students, residents, and practitioners have used the kit, and, although another instrument may have to be added for a specific situation from time to time, the kit will more than suffice for most procedures. The kit was designed with the sequence of most operative procedures in mind. Therefore, instrument sequence in the kit proceeds from the mirror and explorer for In slots (in this order, from left to right, with the open well to the rear):

~ Mirror (No. 5 with handle)
~ Explorer-periodontal probe (XP23/QOW)
~ Cotton forceps (college, with serrations)
~ Plastic instrument, No. 1-2
~ Spoon, discoid, 11~-7-14
~ Hatchet, 10-7-14
~ Hoe, 12-10-16
~ Gingival margin trimmer, 10-80-7-14
~ Gingival margin trimmer, 10-95-7-14
~ Wedelstaedt chisel, 10-15-3
~ TD applicator/No. 313 spatula (Thompson Dental)
~ Condenser, SA1 (Thompson Dental)
~ Condenser, SA2 (Thompson Dental)
~ Condenser, SA3 (Thompson Dental)
~ Burnisher, beavertail-ovoid, 2/30
~ Burnisher, PKT3
~ Carver, cleoid-discoid, UWD5
~ Carver, Walls No. 3
~ Carver, Hollenback No.
~ Carver, interproximal (IPC)
~ Carver, No. 14L
~ Articulating paper forceps
~ Carrier, amalgam, medium/large

In well of tray:

~ Scalpel handle, No. 3, flat
~ Sharpening stone, flat, Arkansas or ceramic
~ Tofflemire retainer, straight
~ Tofflemire retainer, contra-angle
~ Amalgam well, stainless steel, small (Thompson Dental)

examination, to the plastic instrument used to facilitate dam placement as well as for placement of materials, to tooth preparation instruments, to restoration placement instruments. The kit uses a 23-slot tray with a small well (open, boxlike section) from Thompson Dental. Thompson Dental has this tray and others available with customizable color-coded tabs to facilitate replacement of similarly color-coded instruments into the correct positions in the tray.

Clipped to lid of tray:

~ Hemostat, mosquito, 5-inch curved
~ Scissors, Quimby

Sterilized separately and available for each operative procedure:

~ Anesthetic syringe
~ Rubber dam kit (forceps; punch; frame; 1 each of clamps W2A, 27, 212SA and 2 W8ASA clamps [Hu-Friedy])
~ Brasseler bur block (No. A600) with burs arranged in the following order (Fig 6-69):
~ Friction-grip burs, No. ~, ~, 1, 2, 33~, 56, 169L, 170, 329, 330, 7404, 7803, 7901
~ Latch 6urs, No. 2, 4, 6, 8
~ Mandrel for pop-on disks

Magnifiers

Sterilized separately and available for occasional use:

~ Chisel, monangle, 10-4-8
~ Condenser, SA4
~ Hemostat, mosquito, 5-inch straight
~ Mirror, No. 2 (on handle)
~ Proximal contact disks (Thierman Products or Centrex)
~ Rubber dam clamps, 00, W1A, W8A
~ Scaler, McCalls, SM13s-14s
~ Spatula, No. 24 (or 324)
~ Spoon, discoid, 15-8-14
~ Spoon, discoid, 25-9-15
~ Triple angle hoe, 8-3-23

Field Isolation

There are many ways to isolate an area of the mouth or a tooth so that restorative services can be performed without interference from soft tissue, the tongue, saliva, or other fluids. Various tongue- and cheek-retracting devices and suction methods may be used; some of these are discussed later in this chapter. By far the most complete method of obtaining field isolation is the rubber dam, the primary subject of this chapter.

Rubber Dam

Sanford C. Barnum is credited with introducing the rubber dam to the profession in 1864. For many years, the rubber dam has been recognized as an effective method of obtaining field isolation, improving visualization, protecting the patient, and improving the quality of operative dentistry services. It has been demonstrated that most patients prefer the use of the rubber dam for restorative procedures. In recent years, the dam has been acknowledged as an important barrier for prevention of microbial transmission from patients to members of the dental care team. In addition, it is medicolegally prudent to use a dam for procedures in which small objects, such as dental burs or endodontic files, could be aspirated by the patient.

Rubber Dam

Christensen has emphatically stated that the use of the rubber dam not only boosts the quality of restorations but also increases quantity of restorative services because patients are unable to talk or expectorate when the dam is in place. He has further stated that the operating field can only be maintained free of saliva and other contaminants with the dam in place, and the field is more accessible, airborne debris is reduced, and the patient feels more comfortable.

Rubber Dam

There is convincing evidence of the importance of rubber dam use during resin bonding procedures. Barghi et al used cotton roll isolation or rubber dam isolation in bonding resin composite buttons to facial enamel surfaces of teeth that were to be extracted. They found shear bond strengths to be significantly greater when rubber darn isolation was used. The same group, using similar techniques, showed that rubber dam isolation significantly reduced microleakage of resin composite buttons bonded to etched enamel and that salivary contamination may affect the bond strength provided by some dentin bonding systems.

Rubber Dam

Most dentists are taught the use of the rubber dam in dental school, and many suffer tremendous frustrations during rubber dam applications. For the dam to be used and to actually save chair time, the practitioner must be able to apply it quickly and easily. This chapter is designed to describe methods that facilitate use of the rubber dam.

Instruments and Materials

Rubber Dam Material

Rubber dam materials are currently available in an array of colors, ranging from green to lavender to gray to ivory. It is important in operative dentistry to use a dam color that contrasts with the color of teeth; ivory-colored dam is therefore not recommended for operative dentistry procedures. The original gray dam is still the most used, but the bright colors are gaining popularity. Some operators use the gray dam because they believe that it is better for matching shades in tooth-colored restorations. Because shades of restorative materials are selected prior to rubber dam placement and tooth color changes with the enamel desiccation that accompanies rubber dam use, the restorative shade is probably not affected by the use of a brightly colored rubber dam.

Rubber Dam Material

Rubber dam material is available in rolls, either 5 or 6 inches wide, from which squares may be cut. It is also available in sheets that are 5 inches square, usually used for children, and 6 inches square. Rubber dam material is available in several thicknesses, or gauges (Table 7-1). The heavy and extra heavy gauges are recommended for isolation in operative dentistry. If the rubber of the heavier gauges is passed through the interproximal tooth contacts in a single thickness and not bunched in the contacts, the heavy dams are no more difficult to apply than are the thinner materials, and heavier dams are less likely to tear. The heavier materials provide a better seal to teeth and retract tissues more effectively than the thinner materials.

Rubber Dam Material

Rubber dam material has a shelf life of more than a year, but aging is accelerated by heat. Extra boxes of dam material can be stored in a refrigerator to extend the shelf life. Dam material that has exceeded its shelf life becomes brittle and tears easily; unfortunately, this is usually noticed during dam application. A simple test for the resistance of rubber dam material to tearing is to attempt to tear a sheet grasped with thumbs and index fingers; a strong dam will be very difficult to tear. Brittle dam material should be discarded. If the material was recently purchased, it should be returned to the supplier for replacement.

Napkin

The rubber dam napkin is a piece of strong, absorbent cloth or paper placed between the rubber dam and the patient's face. The napkin provides greater comfort for the patient, especially during unusually long procedures. Napkins are available in two shapes (Fig 7-1). The smaller napkin is usually used with rubber dam frames; the larger provides padding for the side of the face when retracting straps are used.

Punch

At least two types of rubber dam punches are available (Figs 7-2a and 7-2b). The Ainsworth-type punch, which is made by several manufacturers, is excellent if it is well made. The Ivory punch (Heraeus Kulzer) is also excellent and has a self-centering coned piston, or punch point, that helps to prevent partially punched holes (Fig 7-3). Punches should have hardened steel cutting tables (or anvils) with a range of hole sizes that the dam will seal against teeth of various cervical diameters (Fig 7-4).

Punch

Occasionally, the rim of a hole may be damaged because the rotating cutting table was not snapped completely into position before an attempt was made to punch a dam. Holes must be cleanly cut; incompletely punched holes (Fig 7-3) will allow tearing of the dam during application or will affect the ability of the dam to seal.

Punch

A damaged hole rim in the cutting table will cause incomplete cutting. The damaged or dull rim can sometimes be sharpened with a mounted flat, coarse sandpaper disk or separating disk used in a low-speed handpiece or a finishing bur used in a high-speed handpiece. The level of the rim of the hole is evenly lowered to an area of the wall of the hole that is beyond the damage. The metal around that hole may then be polished with finer disks. A damaged cutting wheel should usually be replaced; a replacement wheel can be ordered from the manufacturer.

Hole-Positioning Guides

Although many operators punch the holes without a positioning aid, most find it helpful to have some form of guide to determine where the holes should be punched. There are several ways to mark a rubber dam so that holes can be located optimally.

Hole-Positioning Guides

Teeth as a guide. The teeth themselves, or a stone cast of the teeth, can be used in marking the dam. To use the teeth, the dam is held in the desired position in the mouth over the teeth to be included in the isolation. The cusp tips of posterior teeth and incisal edges of anterior teeth can be visualized through the dam, and The centers of the teeth are marked on the dam with a pen. An advantage of this method is precise positioning of the marks even when teeth are malaligned. Its disadvantages include the time-consuming nature of the procedure and the inability to punch a dam before the patient is seated.

Hole-Positioning Guides

Template. Templates are available to guide the marking of the dam (Fig 7-5). These templates are approximately the same size and shape as the unstretched rubber dam itself. Holes in each template correspond to tooth positions. The template is laid over the dam, and a pen is used to mark through selected holes onto The dam. With the template, the dam can be marked and punched before the patient is seated.

Hole-Positioning Guides

Rubber dam stamp. Rubber stamps provide a very convenient and efficient way of marking the dam for punching (Figs 7-6a and 7-6b). There are commercially available stamps, or stamps can be made by any rubber stamp manufacturer from a pattern such as the one. shown in Fig 7-7 or any custom design. Dams should be prestamped by an assistant so that the marks for the maxillary central incisors are positioned approximately 0.9 inch from the top of the dam. Exceptions to normal tooth position are easily accommodated.

Rubber Dam Holders

Strap holders. Strap holders such as the Woodbury holder or retractor (Fig 7-8) provide the most cheek and lip retraction, access, and stability, but may cause the most discomfort to the patient. A rubber dam napkin is a necessity for patient comfort when a strap holder is used. The Woodbury retractor grasps the dam material with spring-loaded clips. When posterior teeth are isolated with a Woodbury-type holder, a tuck or fold in the dam may be needed (Fig 7-9).

Rubber Dam Holders

Frame holders. Frame holders are exemplified by the Young frame (Young Dental) and the Nygaard-Ostby frame (Figs 7-10a to 7-10d). A U-shaped Young frame is made by several manufacturers in both metal and plastic. The Young-type frames are available in both adult and child sizes. A plastic frame is advantageous when radiographs will be a part of the procedure because it is radiolucent. The plastic frames do not, however, stand up to heat sterilization as well as metal frames, and they have a shorter life span. Metal frames are less bulky and last for years. They are available with balls on the ends to protect the patient in the event that the frame is inadvertently pushed toward the eyes.

Rubber Dam Holders

The Young frame is usually positioned on the outside surface of the dam so that it is not in contact with the patient's face. The Nygaard-Ostby frame is normally positioned on the tissue surface or inside surface of the dam and touches the patient's face (or the rubber dam napkin). All frames have points or pegs over which the dam material is stretched to provide a clear operating field and to hold the frame in position.

Rubber Dam Holders

Preattached frames. One commercially available rubber dam (HandiDam, Aseptico) comes with a built-in frame and a rod for insertion to keep the dam open (Fig 7-1 1).

Clamp Forceps

Ivory-type clamp forceps are available from several manufacturers and with differently angled beaks (Fig 7-12a). Ivory forceps (Ivory, Heraeus Kulzer) have stabilizers that prevent the clamp from rotating on the beaks (Fig 7-12b). This is usually advantageous, but it limits the use of these forceps to teeth that are within a range of normal angulation.

Clamp Forceps

Stokes-type clamp forceps (Fig 7-12c), which have notches near the tips of their beaks in which to locate the holes of a rubber dam clamp (Fig 7-12d), allow a range of rotation for the clamp so that it may be positioned on teeth that are mesially or distally angled.

Clamp Forceps

Either of these types of clamp forceps will serve the practitioner ,veil, and selection should be based on personal preference. The Ivory-type forceps are probably the most popular because of cost.

Clamps

Rubber dam clamps are the usual means of retaining the rubber dam. The three basic types of clamps and their parts are shown in Fig 7-13. When a posterior segment is isolated, the clamp is usually placed on the distal-most exposed tooth (Fig 7-14). The clamp may also be placed on an unexposed tooth (one for which a hole has not been punched) (Fig 7-15). There are clamps with jaw sizes to fit every tooth. Some clamps simply have a number designation; others have a W in front of the number. The W indicates that the clamp is wingless (Fig 7-13b); those clamps that do not bear a W have wings (Fig 7-13a) so that the dam may be attached to the wings before the clamp is placed on the tooth (Fig 7-16).

Clamps

Although in recent years manufacturers have reduced the number of clamps they produce, a variety of clamp designs remain available. For the practice of operative dentistry, the number of clamps should be limited to a few that will satisfy most needs; these may be kept in the instrument kit and sterilized along with the other operative dentistry instruments. Clamps that will serve in most situations and are recommended for inclusion in operative dentistry instrument kits are listed in Table 7-2 and shown in Fig 7-17.

Clamps

Supplemental clamps, to be available on the rare occasions when the usual clamps will not suffice, should be packaged and sterilized separately. Recommended supplemental clamps are listed in Table 7-3 and shown in Fig 7-18.

Clamps

Number WSA clamp. Although Ivory modified the design of the No. W8A clamp several years ago so that the jaw points do not extend so severely in a gingival direction, some No. WSA clamps still have points that extend further gingivally than is desirable. The jaws of a No. W8A clamp, for most applications, should be approximately horizontal (Fig 7-19) prior to expansion of the clamp for placement on a tooth. As the jaws are spread, the angle of the jaws will change to a gingival orientation; this is usually desirable, but before the clamp is expanded, the jaws should have little or no gingival angulation.

Clamps

For No. WSA clamps in which the jaws have a significant gingival angulation, a modification procedure is recommended (Figs 7-19a to 7-19c). This modification may be made with a stone used in a low-speed handpiece or a finishing bur used in a high-speed hand-piece. After the modification is made, the points, which have been sharpened by the modification procedure, must be blunted to prevent damage to tooth surfaces.

Clamps

The No. W8ASA clamp (Fig 7-20) was recently introduced by Hu-Friedy. This new design incorporates most of the advantages of the modification of the No. WSA described above and in Fig 7-19. Butterfly clamps. Most of the clamps listed in Tables 7-2 and 7-3 may act as rubber dam retainers (placed on the distal tooth or teeth to hold the dam on the quadrant or arch) or as rubber dam and gingival tissue retractors (to retract the dam and tissues away from a preparation margin in the cervical area of a tooth). One clamp, however, the butterfly clamp, No. 212SA (Fig 7-21a), is designed to serve as a retractor only. Because of its double bow and the closeness of the points of each jaw, this clamp must be stabilized on the tooth (Fig 7-21b), or it may rock mesiodistally during the procedure and damage the root. Dental impression compound (such as red or green compound, Kerr/Sybron) should be used under the bows of the clamp on the occlusal (or incisal) and lingual aspects of the teeth to provide stabilization.

Clamps

The double bow of the No. 212SA clamp precludes placement of two clamps on adjacent teeth. When two Class 5 restorations are to be placed on adjacent teeth, two No. 212SA clamps may be modified (Fig 7-21c); one of the bows of each clamp is cut off so that the remaining bow of one clamp extends to the right and the bow of the other extends to the left. If these clamps are stabilized with modeling compound, adjacent Class 5 restorations may be accomplished simultaneously (Fig 7-21d). A No. 212SA clamp or a modified No. 212SA clamp may be used on one root of a molar as well as on single-rooted teeth.

Clamps

Tooth contact. An important consideration when a clamp is selected is that only its jaw points contact the tooth; this gives four-point contact (Fig 7-22). No clamp jaw can ever be contoured to fit a tooth precisely, nor is there any reason for a clamp to fit precisely because the dam, not the clamp, creates the seal. Molar clamps should have accentuated arches between the jaw points to ensure that the points are in contact with the tooth, even in teeth with very convex cervical areas. The distance between the points of a jaw, along with the strength of the bow of the clamp, determines the stability of the clamp. If there is contact between the tooth and any other part of the clamp's jaw, the contact points are brought closer together, thus reducing the stability of the clamp and allowing it to rotate on the tooth and, occasionally, to be dislodged from the tooth. Four-point contact is, therefore, very desirable.

Clamps

The strength or temper of the bow of the clamp should also be maintained. Clamps should be expanded with the clamp forceps no more than is necessary for the clamp to be passed over the facial and lingual heights of contour of the tooth. If a clamp has been overexpanded, it will grasp the tooth with less strength and is more likely to be dislodged. Occasionally, the jaws of clamps that have been overexpanded may be squeezed together so that enough of the strength returns, but it is usually best to discard a clamp that has been overexpanded.

Clamps

Floss ligatures. Many clinicians and dental schools recommend that dental floss be attached to every clamp used in the mouth to allow retrieval if the clamp is dislodged or breaks. Certainly, it is wise to attach floss to the clamp that is positioned in the mouth prior to application of the dam. After dam placement is completed, however, the floss causes leakage if it extends under the dam or is in the way if left to dangle in the operating field. A solution is to attach the floss to the clamp during application of the dam (see Fig 7-35a) and to cut and detach the floss from the clamp after the dam is in place. If the clamp dislodges or breaks after the dam is in place, it will be either catapulted from the mouth by the tension of the dam or will be trapped by the dam so that it cannot be swallowed or aspirated.

Clamps

When a winged clamp is attached to the dam during placement of the clamp onto a tooth, the attachment of a floss ligature to the clamp is redundant. Floss also need not be attached to a second clamp placed for retraction after the dam is in place.

Other Retainers

Other methods are sometimes used for rubber dam retention:

1. Dental floss or tape is placed doubly through a contact and then cut to a short length so that it does not impede access (Fig 7-23a).
2. A short strip of rubber dam material is cut from the edge of the rubber dam, stretched and carried through the contact, and then allowed to relax to retain the dam (Fig 7-23b).
3. Floss is tied to a sterilized rubber plunger from an anesthetic cartridge or similar item and then tied around the most distal isolated tooth (Fig 7-23c).
4. Elastic cord, eg, Wedjets (Hygenic), is placed interproximally to retain the dam (Figs 7-23d and 7-23e).

Modeling Compound

Modeling compound may be used as an adjunct to the application of any clamp as a retainer or retractor. It is especially useful and necessary for anchoring and stabilizing the No. 212SA retainer (see Figs 7-21b and 7-21d).

Modeling Compound

For stabilizing a clamp, use of modeling compound in the stick form, either red or green (Kerr/Sybron), is recommended. The clamp is positioned appropriately on the tooth and held in position with a finger until stabilization is completed. A compound stick is held over a low alcohol flame and rotated and moved back and forth so that the length to be softened is heated evenly (Fig 7-24a). After the surface is softened, the stick is withdrawn from the flame to allow the heat to diffuse to the center of the stick. When the length is warmed to the center, there will no longer be a core of unsoftened compound to support the shape, and the softened length will sag or droop (Fig 7-24b). If the stick has been overheated, so that it elongates in addition to drooping, it should be tempered in a container of water. Before the compound is taken to the mouth, the surface should be briefly reheated to enhance adhesion of the compound to the retracting clamp and teeth.

Modeling Compound

The stick should be applied to the retainer and teeth in a location as far away from the area to be restored as possible. The stick is then twisted and pulled away, leaving softened compound in place. The compound should be shaped and molded with damp, gloved fingers into embrasures and made to contact a large area of the clamp and the lingual surfaces of the teeth. It should then be cooled with the air syringe. Stabilization of the retracting clamp is then completed (Fig 7-24c); the finger holding the clamp may now be released, and the clamp is tested for stability.

Modeling Compound

Compound should be kept away from the planned area of operation so that it will not inhibit access; in that regard, for a facial restoration, compound should be confined to the occlusal (or incisal) and lingual surfaces. Full advantage should be taken of the lingual surfaces for maximum dependability of attachment of the compound to the teeth. When the lingual surfaces are covered by the compound, the lingual notches for the clamp forceps will be covered. To remove the clamp with forceps, the operator would have to chip away the compound to expose a lingual notch. In a simpler method, an instrument is used to pull the facial jaw of the clamp away from the facial surface and then occlusally (incisally) (Figs 7-24d to 7-24i).

Inverting Instrument

Almost any instrument may be used for inverting the dam. Commonly used instruments include explorers such as the No. 23 (Fig 7-25a), plastic filling instruments such as the No. 1-2 (Fig 7-25b), or a beavertail burnisher (Fig 7-25c). Dental tape or floss used interproximally is also useful for dam inversion.

Wedge

The wooden wedge, which is used to stabilize a matrix and hold it against the gingival margin of a cavity preparation involving a proximal tooth surface, is also useful for protecting the dam (Fig 7-26) when rotary cutting instruments are used in proximal areas. Placement of water-soluble rubber dam lubricant on the wedge enhances the ease of wedge placement.

Scissors

Scissors are often useful in preparing the dam for insertion and are a necessity for cutting the dam for removal. Blunt-ended scissors are preferred by many operators, but other scissors, such as sharp crown and collar scissors and Quimby scissors (see Fig 7-40b), will also serve well. Scissors used for cutting rubber dams must be sharp, or they will frustrate the operator.

Dental Tape and Floss

Waxed tape or floss, not unwaxed floss, is recommended for flossing the dam through interproximal contacts. Waxed tape, or ribbon floss (see Fig 7-35f), will carry more of a septum through a contact in a single pass than will the narrower floss, but the tape must be maintained flat and not bunched up, or it will be difficult to pass through the contact.

Proximal Contact Disk

A proximal contact disk (Thierman Products or Centrix) is used to plane rough enamel, amalgam, or resin composite contacts so that the floss will pass through without shredding and so that the dam can be flossed through without tearing (Figs 7-27a to 7-27c). The plane metal disk, without abrasive, is recommended. This instrument should not be used in contacts that involve a gold casting because it can cut into the gold and produce additional obstruction to passage of the floss through the contact.

Proximal Contact Disk

The disk is placed into the occlusal embrasure and rocked facially and lingually as it is pushed firmly, but with control, gingivally. If it cannot be worked through the contact, the teeth should be separated slightly with a plastic instrument placed snugly into the gingival embrasure and torqued slightly while the disk is being pushed into the contact from the occlusal embrasure. Several passes of the disk through the contact will usually plane it smooth.

Lubricant

Rubber dam lubricant makes a significant difference in the ease with which the dam is applied. A water-soluble lubricant is preferred. A product that has proven especially suitable for lubricating the rubber dam is Velvachol water-miscible vehicle (Healthpoint) (Fig 7-28). Velvachol is a pharmaceutical product manufactured as a water-soluble ointment base, but it is an excellent dam lubricant. Petroleum-based lubricants, such as Vaseline (Chesebrough-Pond's), should be avoided as rubber dam lubricants because they are difficult to remove from the dam after application and, therefore, can impede bonding procedures and make inversion of the dam more difficult.

Lubricant

Water-soluble lubricant is applied in a thin coat around the holes on the tissue surface of the dam before it is taken to the mouth (Figs 7-29a and 7-29b). The lubricant makes passage of the dam through the interproximal contacts much easier, and the dam will often pass through the contacts, in a single layer, without the use of floss. If additional lubrication is desired, lubricant may be applied to the teeth prior to placement of the dam. A lubricant for the lips will make the patient more comfortable during the procedure. A petroleum-based lubricant, such as Vaseline, cocoa butter, silicate lubricant, or lip balm, functions well as a lip lubricant.