Mouth Gags and their evolution

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Introduction:

Mouth gags are instruments that help in keeping the jaws of the patient open enabling the surgeon to perform oral cavity and oropharyngeal surgeries. These mouth gags have undergone numerous modifications to make the life of surgeons that much easier while performing intraoral surgeries. The original idea of keeping both the jaws apart was borrowed from Dentists. They had many instruments that could keep the jaws apart. Further more an ideal mouth gag should keep the tongue away from the field of surgery while exposing the area in question adequately. The mouth gag when applied should not cause compression over the endotracheal tube through which oxygen and anesthetic gases will be transferred to the lungs of the patient during the surgical procedure. Different types of mouth gags were designed to suit varying requirements of the surgeons and the anesthetists.

In medieval times mouth gags were used as torture instruments. They went by the name “Kiefer” / “Mundsperre”. Torture using mouth gags were lawful under Roman Law and was recognized as a legitimate torture tool.

These gags were later used for intra oral examinations and surgical procedures involving the oral cavity.

Features of an ideal mouth gag:

1. It should provide adequate exposure of all parts of the oral cavity to facilitate the surgeon to perform intraoral surgeries.

2. It should be easy to apply

3. It should be self retaining allowing the surgeon to have both the hands free to perform the desired surgical procedure.

4. It should be easy to apply in all types of anatomical and other variants that could be caused by the disease.

5. It should enable safe anesthesia by not causing compression / kinking of the endotracheal tube.

6. It should hold back the tongue from falling into surgeon’s field

7. It should not slide or slip

There is no single mouth gag that can be satisfactorily used by all surgeons. Hence various modifications are available even though the concept is the same.
Some of the commonly used mouth gags include:

Mouth gags without tongue blade:

These gags simply act as just mouth openers. These gags invariably will not hold the tongue away from surgeon’s field. A tongue stitch should be provided to hold the tongue from falling into the surgeon’s field of vision. These gags were initially used for examination of oral cavity and by anesthetists during intubation.

Lane mouth gag:

This mouth gag keeps the mouth open. It does not have a tongue blade and hence a tongue stitch needs to be provided to prevent tongue falling and occluding the airway. This type of mouth gag is commonly used in pediatric practice to keep a child’s mouth open.
This mouth gag has two prongs which can be used to hold the mouth open. The distance between these prongs can either be increased or decreased by using the screws provided for this purpose.

Rose mouth gag:

This mouth gag also does not have a tongue blade. Its main function is just to hold the jaws apart to ensure that oral cavity is kept open. Unlike Lane mouth gag it does not have a screw mechanism to adjust jaw opening, instead it is provided with a ratchet. A surgeon by just bringing together the handles of the gag can increase the distance between the prongs.

The ratchet mechanism has its own advantages. Surgeon can widen the oral cavity by using only one hand to stabilize the gag.
Doyen Jenson Mouth gag:

This gag also does not have a tongue blade. Its main function is to keep the mouth of the patient open and to prevent bite injury to the examiner’s fingers.

![Doyen Jenson mouth gag](image)

This mouth gag also works on ratchet principle. The blades of this gag can be separated by bringing the finger limbs together. The position of the blade is maintained due to the presence of ratchet mechanism.

Mason modified this mouth gag to help anesthesiologist to deliver gases to the lungs. In this modification the blades of the mouth gag was provided with metal tubes through which gases can be insufflated.

Ferguson’s mouth gag:

Hewitt modified Ferguson’s mouth gag by adding two tubes to the gag to deliver chloroform vapor.
Ferguson’s mouth gag

The main advantage of this mouth gag is that its handle does not affect surgical field.

Hewitt’s modification of Ferguson’s mouth gag

Gags provided with additional source of light:

Major difficulties faced by the surgeon while operating inside the oral cavity is:

1. Narrow space
2. Inadequate light

The oral cavity space can be somewhat increased by application of mouth gag. Lighting can be improved by providing light at the end of the mouth gag blades. Modification is available in Hewitt’s
mouth gag model where a small Cecil leaf light is which could illuminate using battery power is attached to one of the limbs of the mouth gag. With the advancement in lighting systems like fibreoptics the currently available models are provided with fibreoptic lighting systems.

Gags with spring catch:

It was Coleman in 1861 who developed a mouth gag based on the principle of forceps with a subtle difference where the handles do not cross each other at the hinge. Attached to one of the handles is a spring catch which helps in keeping the blades fixed at any required distance from each other.

The extremities of this mouth gag are covered on their outer surface by India rubber guards. While using the instrument, the handles are opened and the blades are brought together and introduced between the teeth at the back of the mouth. The patient’s mouth can be opened by compressing the handles of the mouth gag. The spring catch maintains the position of the blades.

William Robert Ackland’s modification of Ferguson’s mouth gag:

William Robert Ackland a British Dentist added grooved jaws to Ferguson’s mouth gag. These grooves were designed to fit against the teeth of the patient. These grooves ensured that the mouth gag securely held itself in place keeping the mouth open.

Mouth gags with sheet spring retention:

Many forceps type mouth gags were designed and used. Of course they showed minor differences. It was Black in 1921 who described a forceps type mouth gag with sheet spring to keep the jaws closed while inserting the mouth gag. Ring type retention system was used.
Mouth gags with tongue blade:

In these type of mouth gags the tongue blade serves as lingual retractor. Thomas Smith 1868 first incorporated a tongue depressor to a mouth gag.
This type of mouth gag had a small tongue blade just to prevent tongue fall. It is provided with a pair of rings which when tightened will increase the distance between the blades thereby keeping the mouth open.

Whitehead mouth gag:

This is another type of mouth gag combined with a tongue blade. This was designed by Whitehead.

Mouth Gags with slotted tongue blades:
These gags needed external support to hold them in position. The support was in the form of M stand/Draffin bipod. Initially suspension apparatus designed by Thacker–Neville was used. Since it was too unwieldy other smaller support systems were preferred. This modification became essential with the advent of endotracheal anesthesia. The tongue blade of all mouth gags had a tendency to compress endotracheal tube compromising ventilation. One important modification that became popular was the provision of a slot in the tongue blade to facilitate the housing of endotracheal tube without causing compression. This modification was first designed by Davis. The slot that was cut in the tongue blade extended approximately for 2/5 of the length of the tongue blade.

At the distal end of the blade a short shallow trough would be provided. Similar modifications were suggested by Doughty in 1957.
Boyle’s Davis mouth gag:

This mouth gag is commonly used to expose the oral cavity and oropharynx during tonsillectomy.

Advantages of Boyle Davis Mouth gag:

1. Provides excellent exposure of oropharyngeal structures including palatine tonsils

2. It can be stabilized using a M jack or Draffin pod allowing the surgeon to have both hands free

3. The mouth gag and tongue blades can easily be dismantled and reassembled hence tongue blades of various sizes can be used as per the requirement of the size of patient’s mouth.

Uses of this mouth gag include:

1. Tonsillectomy

2. Adenoidectomy
3. UPPP and other soft palatal surgical procedures

4. Surgical procedures involving the hard palate

Disadvantages:

1. This type of mouth gag cannot be used for tongue surgeries because the tongue blade would completely hide the tongue.

2. This mouth gag could injure teeth and lips if not applied with care

3. Excessive mouth opening using this mouth gag would cause tempormandibular joint dislocation.
Doughty mouth gag:

Andrew Doughty was credited with the designing of Doughty mouth gag. He split the tongue blade of the classic Boyle Davis mouth gag so that the endotracheal tube can be held in the groove without any danger of compression to the tube.
Doughty mouth gag showing slot in the tongue blade that could accommodate the endotracheal tube without the danger of compressing it

Sommerland and Mehendale in the year 2000 suggested a number of modifications of tongue blade of Dott mouth gag in order to facilitate cleft palate repair. This was done to suit the small infants who underwent these procedures frequently.

The highly reflective surface of the tongue blade was given a matt finish to eliminate the glare. The two flanges at the base of tongue blade was removed thereby eliminating a pressure source on the lower lip.

Sommerland modification of tongue blade on the right side where the flanges at the base of the tongue blade has been removed
Agarwal and Panda modified Dott's mouth gag by placing two parallel bars over the lingual surface of the tongue blades. This rather simple modification really prevented compression of the endotracheal tube.
Dott mouth gag:

Norman Dott of Edinburg constructed a mouth gag. This gag is actually the precursor of all popular mouth gags of today. It is shaped like a "C" with one side open. It consists of two parts.

The upper part is provided with jaw hooks and the lower is the sliding part with the tongue blade. This gag is easy to apply and still more easy to maintain.

Dott mouth gag

Even though it has its own similarities to Boyle Davis mouth gag, this was independently developed by Dott. This is a classic example of open frame mouth gag.
Gag with closed frame:

It was in 1962 Dingman and Gabb modified the C shaped open frame Dott mouth gag into a rectangular and closed frame gag. The tongue blade supports the gag inferiorly and also held the endotracheal tube close to the tongue. To this rectangular frame side retractors were mounted on universal joints. These side retractors hooked the lips at their angle and pulled them laterally. Major drawback of this otherwise popular mouth gag is the lack of adaptability and cannot be used in the presence of irregularities in the alveolus.
Thompson’s modification of Dingman mouth gag:

In order to overcome the lack of adaptability of Dingman mouth gag in the presence of irregular alveolus Thompson opened up the closed frame of Dingman mouth gag. This was done by removing the central segment of the cephalad side of the rectangular frame. This provided more space for the surgeon to work in the anterior portion of the palate. This was very helpful in performing cleft palate repair.

Mouth gag with adjustable split alveolar bar:

This type of mouth gags would be very useful during cleft palate repair surgical procedures. Many of the severe grade cleft palate patients have abnormal spacing between the maxillary alveolar arches. It will be really difficult to fit both alveolar hook retractors of Dingman type mouth gag in these patients. To overcome this difficulty Millard and Slepyan introduced the Miami device. This gag had open frame in the cephalad end similar to the Thompson’s mouth gag. The jaw hooks were made independently adjustable. The swivel hook retractors were made removable and hence suitable sized retractors can be inserted to make the mouth gag more versatile.
Gag with long hooks:

This type of mouth gag improved oral cavity visibility. It was Rao and Peter who suggested this modification. The basic structure of the gag was more or less similar to Dingman mouth gag. The length of the hooks that fitted into the alveolus and teeth was increased. This increase in the length of the hooks displaced the horizontal bar superiorly thereby improving access to the anterior portion of the palate. The entire frame assembly was more curved allowing for sliding and fitting into the more distal dentitions. This again improved exposure to the anterior portion of the palate.
Mouth gags with sliding stem:

Major problem with the mouth gags already described is that they cannot be used to perform surgeries on the tongue. This is because the tongue blade invariably hindered access to the tongue. In this type of mouth gag the tongue blade is done away with. The lower part of this modified mouth gag consists of a sliding stem which is combined with jaw holding adjustable device.

The fact that there are numerous modifications documented and undocumented to the established mouth gags indicate no one gag is perfect for performing surgeries inside the oral cavity. A large number of modifications and variants of the existing mouth gags are available. It is for the surgeon to decide which one would fit the surgical requirements.