The Silencer® is a dual component mandibular advancement device that features an implant grade titanium precision attachment called the Halstrom Hinge™ which provides the multiple adjustment features of the appliance. The Silencer® offers both anteroposterior as well as vertical adjustment features.
“Necessity is the mother of invention” – After a long history of loud snoring, ever increasing daytime sleepiness and four single vehicle car crashes – Dr. Halstrom hit a freeway abutment at 60mph – sound asleep. After three years of research at the University of BC, The Silencer® was born.
Wayne’s First Appliance

“The sophistication of the appliance directly affects the dynamics of treatment.”

The simplest form of mandibular advancement device – a #15 fish hook – a cup hook and a fishing reel. – pass the fishing line through the cup hook placed in the ceiling and give the reel to the wife!
After personally experiencing the benefits of mandibular advancement Dr. Halstrom spent hours in an MRI taking shots of the airway in differing mandibular positions.

In this image we see an airway with a Mallampati Class II and a narrow airway.
Axial view of the narrowest point of the velopharynx.
Axial view of the same MRI slice with The Silencer® in position and showing the airway expansion.
1. Sagittal view of the airway without advancement of the mandible;
2. A partially titrated position; and
3. An optimally titrated appliance providing maximum airway expansion.
Mr. Mark Hebbard – Guinness Record Book holder of the title of “World’s Loudest snorer”. Dr. Halstrom treated Mark in 1993 after failed CPAP and surgical procedures.
Mark had been a patient at the University of British Columbia Sleep Research Center. He set his world record snoring mark during his first sleep study in 1987 – 90 decibels. His minimum oxygen saturation of 14% so alarmed the staff that the sleep study was repeated two weeks later. While his minimum Oxygen saturation was improved from 14% to 48% his OSA events had increased from 138 to 332. He subsequently failed CPAP therapy and eventually had a full UPPP procedure in 1990. His follow up post surgical sleep study revealed that his OSA events remained unacceptably high at 221, his oxygen saturation had gone from 48% to 60% leaving him in the unenviable position that his life was still in danger every time he shut his eyes. Dr. H placed Mark’s Silencer appliance in October of 1994. His follow up sleep study revealed that his OSA events dropped to 3, his RDI was 8, his minimum oxygen saturation had risen to 87% and his snoring was gone. He had left the UBC sleep program because he refused to accept full mask CPAP therapy. Mark had been warned by the UBC medical staff that he could expect that his life span would be shortened by 15 years due to his lifelong obstructive sleep apnea.

He was finally successfully treated at age 46, he nevertheless died at age 54 of a Cardiovascular incident probably relating, as predicted, to the damage done by his lifelong obstructive sleep apnea.

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Mark speaks about his treatment experience and therapeutic success with The Silencer®.
Treatment Philosophy

- Reversible non-invasive treatment:
  - Mandibular Support
  - Positional Mandibular Manipulation
    - Anterior Positioning
    - Vertical Positioning
    - Lateral mobility
  - Comfortable / Convenient / Effective
Characteristics

The Silencer® Professional

- Titration
  - Advancement
  - Vertical Opening
- Balanced Occlusion
- Lateral Mobility
- Stabilized Dentition
  - Full Occlusal Coverage
  - Cusp Tips Can Be Captured In Hard Acrylic
Characteristics
The Silencer® Professional

- Durability
  - Five Years (precision attachment warranty)
- Materials & Fabrication
  - Elastomer / Hard Acrylic
  - Impact / Talon Style Materials
  - Lab Fabricated
Can The Silencer® be used for edentulous cases?

ABSOLUTELY!

The patient with a partially edentulous situation involving a complete maxillary denture is easily treated by using a duplicate of the patient’s denture. The maxillary components of the Halstrom Hinge™ are incorporated into the duplicate denture. Bite pads are build over the posterior teeth of the denture to occlude with the bite pads on the usual and customary lower unit of the Silencer appliance.

The fully edentulous patients may also be treated by using the same duplicate denture process as with the partially edentulous. Due to the constraints of the retention of the lower jaw in the completely edentulous configuration the case will require special attention as the patient must accommodate to the wearing of the enjoined "night time denture".
Comparison of an appliance worn for ten years and it's remake.
Sleep Apnea & Bruxism
A CAT scan of Dr. Halstrom

Image 1 – Resting Airway
Image 2 – Mueller maneuver
Image 3 – Mueller with clench

The only difference in the image is that Dr. Halstrom clenched his teeth. Should we be surprised that apneic patients grind their teeth? The most powerful reflex action exhibited by the mammal is to protect the airway. An involuntary clenching of the teeth due to the obstruction of the airway during an apnea event may trigger what we know of as bruxism.

This is a fundamental reason why dentists should be screening their patients for obstructive sleep disordered breathing, especially before embarking on extensive restorative dentistry that could be put at risk by the clenching that occurs due to the presence of sleep apnea.
**Dental Implications OSA - Bruxism**

- **University of Montreal**
  - Use of a single arch night guard has been shown to increase the severity of the patients underlying sleep apnea by a factor of 50% - 50% of the time.
  - Two component night guards which may offer mandibular advancement, are twice as effective as single component guards in reducing bruxism events.

Implications for the OSA patients by the presence of night guards.
Apnea patients Occlusal splint = RISK of aggravation in 50% of Sleep
(Open study; Gagnon et coll, Int J Prosth 2004)

The presentation of the study patients. One patient goes from an index of 40 to 80 shows clearly that this patient’s life is put at risk by the presence of a single arch night guard!
A 1,000 patient review was conducted in 2007 as a randomly selected group of Dr. Halstrom’s patients. From the 1,000 patients in the first group, which revealed statistics on range of motion etc., 100 patients were randomly selected for a personal telephone interview seeking to obtain answers to the noted questions.
The dental office procedures involved in the creation of a Silencer® are nothing unusual. The single exception is the recommended use of an external gothic arch tracing device (GAT™). While other ROM measurement devices offer a measurement of the range of motion of the patient the GAT™ offers a diagnostic component as well as a measuring tool.
GAT™ – Gothic Arch Tracer
What does the GAT tell us?

- Defined A/P range of motion
- Defined lateral range of motion
- Midline
- Deviations
- Mandibular GPS
A completely “normal” gothic arch tracing identifying:
1. Straight line “mid line” - identifying no deviations from normal joint function.
2. Easily measured and accurate Range of Motion.
3. Identifying a symmetrical pattern of lateral movement.
Identifies a curved mid line which is of significance in setting up the Halstrom Hinge™ as well as identifying some abnormality in the joint patterns.
Further identification of mid line deviation. The staring point for setting up the HH is created by the drilling of the guide hole slightly to the inside of the curve so that advancement of the jaw will bring the appliance back into a position “on the mid line” as treatment progresses.
Shows a variation of movement of the mandible with the advancement pathway differing from the backward movement pathway.
Shows a significant deviation of mid line. In the setting up of the Halstrom Hinge™ so that the advancement of the mandible follows the mid line the maxillary retention plate of the Halstrom Hinge™ is offset to match the deviation. In this way the patient is kept on the mid line as the appliance is adjusted thereby allowing for an equal freedom of movement from left to right within the mandibular guidance box of the hinge.
This shows a highly unusual pathway of the mandible upon advancement beyond the 70% of ROM position. It would be wise not to go beyond this point in the ROM. It is possible that by wearing a Silencer® appliance for some time this aberration may disappear.
Shows mixing of a polyvinylsiloxane impression material that offers the stabilization of the tracing trays when placed in the mouth.
Shows the placement of the impression material in the anterior cavities of the upper and lower GAT™ trays.
Shows the placement of the trays in the mouth. It is important to hold the trays with the tracing arm centered over the tracing plate. Some patients have a variation in the occlusal plane. For instance a long cuspid on one side will tend to shift the tracing arm to the shorter toothed side. In cases of significant occlusal plane levels this may mean that the tracing will be off to one side of the tracing plate. This is not significant unless the tracing arm is so far to one side as to have the tracing pencil go off the side of the tracing plate.
Placement of a post-it-note that can be used as the tracing paper. This tracing is kept in the patient's chart as a permanent part of the patient's record. It allows the dentist to go back at any time and identify any deviations in a normal joint pattern of tracing as well as to define the eventual positioning of the start of the therapy.
Placement of the pencil tool threaded into the upper tray.
Guiding the patient through the motions necessary to create the GAT™.
Measurement of the ROM – leading to a decision as to where this patient will be set to start therapy.
Notation of the ROM on the tracing paper.
Drilling of a hole at the desired start point – using a #6 round bur, and cutting off the furl left by the drilling process.
Having made the diagnostic decisions as to the start point and drilling the hole, some of the impression material should be cut away to reveal extra holes in the GAT™ trays for retention of the impression material to be used in the final bite registration.
Placement of the impression material around the “bite forks
Trays are ready to be placed into the mouth
Once the trays are positioned the patient is instructed to grind the plates together to mill out the impression material. If this step is not taken and there is an uneven amount of impression material between the trays from side to side comparison the bite pads on the returned case will be our of balance. This will necessitate a balancing of the bite pads. When the tracing pencil is engaged and falls into the drilled hole and the impression material is set the final bite registration is complete.
The completed bite registration. Following this step the positioning pin is removed and retained. The case is now ready to send to the laboratory.
Significant mid line deviation possibly resulting from a “closed lock” TMJ configuration. Date of tracing – June 12, 1995
New GAT™ taken December 2, 1996 – shows a straight line GAT™ mid line, suggesting the “recapture” of the deviated joint or a relief from the TMJ issues that caused the mid line deflection.
Data from 237 randomly selected GAT™ tracings.
Identifies data on the initial setting and final setting of the patients in respect the amount of ROM used in their therapy.
GAT Case Study, 2006

- Repairs & Maintenance
  - 237 Cases
  - 1 to 12 Years in Place
  - 69 Cases three years or less
  - 168 Cases three years plus
  - 126 Cases over five years
  - 8 cases over ten years
  - Broken Stylus Pins 14% (in office repair)
  - Body Material Failure (acrylic crack) 2%
  - Stripped Pin 6% (laboratory repair)

The repair and maintenance experience taken from these charts was as detailed above.
FDA regulatory information.

- FDA 510K
  - K954530
  - November 1995
  - Indications For Use
    - Snoring
    - Sleep Apnea
Research


- Sleep Medicine, In Press, June 2008, Sleep Medicine Efficacy of two mandibular advancement appliances in the management of snoring and mild-moderate sleep apnea: A cross-over randomized study. Luc Gauthier, Luc Laberge, Michel Beaudry, Mario Laforte, Pierre H. Rompre’, Gilles J. Lavigne