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THE BOSTON OVERLAP BRACE MANUAL

PREFACE

The prevalence of widespread back disorders is well known, but for a variety of reasons, most braces prescribed frequently fail to improve patient function. We believe that this failure results primarily because of a lack of communication between those involved.
Relatively few patients are seen in a "Back Clinic" or are treated with a "Team Approach System". Many orthotists are not sufficiently knowledgeable about the proper use of spinal orthoses. Well-designed and properly used modern back bracing systems can play a significant role in ameliorating back discomfort in our society. Important elements will be use of the "Team Approach" (as used so successfully in the management of scoliosis), and better education for the orthotist in the indications for fitting and proper use of these systems.

INTRODUCTION

We have found the Boston Overlap Brace is most effective when prescribed, fabricated, and checked as a group venture involving the orthopedic surgeon, the orthotist and the physical therapist, when necessary.

WHAT IT IS

The Boston Overlap Brace, or "BOB", is an anterior opening, antilordotic, semilordotic, or lordotic brace constructed of thermoplastic material designed specifically for patients suffering from chronic or temporarily severe back pain.
It is constructed of an adjustable external shell, made of preformed, variable thickness special formula thermoformed material, to which may be added an optional liner of polyethylene foam. The anterior closures are of spring steel (in 1" increments) from 6" to 12" long, and shaped for the appropriate degree of concavity, covered by Dacron. The fasteners are of Dacron covered Velcro, or optional cotton strapping with buckles.

HOW IT WORKS

The Boston Overlap Brace (BOB) was designed specifically for patients suffering from chronic or temporary severe lower back pain.
Clinical tests indicate that this unique design, a refinement of the Boston Brace System, is also a useful tool in the treatment and prevention of trauma from extended sports activity.
In fact, initial tests have shown the Boston Overlap Brace (BOB) to be effective in actually improving patient comfort and function in over 90% of patients with severe back pain from a variety of causes. It is used successfully for patients in age groups ranging from adolescence to old age, and with a wide variety of occupations.
The Boston Overlap Brace (BOB) works in a simple, yet remarkably effective manner. First, the sturdy and comfortable polyethylene frame, which can be padded with an optional thermobonded or removable foam liner, safely positions the lower back region until there is sufficient muscular relaxation to alleviate most of the pain. At the same time, the frontal enclosure of the brace works to compress the lower abdominal muscles in order to control lordosis of the spine through use of the various anterior-posterior shapes that may be required. Repeated testing and evaluation confirm that the BOB's combination of contra-abdominal pressure, attainment of an antilordotic posture of the spine, and the spinal distraction effect results in significant improvement in back pain for most patients.
The BOB is also proving useful in other areas. Although not designed as a corrective or preventative item in the treatment of patients with impeded muscular control, the use of the BOB is proving to be a welcome relief for many.

Because the brace actually stabilizes the lumbar spine, rendering it asymptomatic, it allows the patient to continue participating in events such as playing hockey or football, etc. Here, the BOB acts as both a brace and a protective device. For patients with recurring lower back discomfort, this orthosis may be worn during daily activity, thus reducing some of the discomfort associated with certain stress-producing professions. And, because of its individual form-fitting design, it may be worn during both indoor and outdoor activities, which would otherwise limit patient participation altogether.
In summation, the BOB is superior to other spinal braces in comfort and total support for the patient. Corrective braces, used to force structural changes, are often necessarily uncomfortable. A supportive brace like the BOB should be comfortable, so as to encourage patient use.

BACKGROUND

Originally called the "modified Boston Brace", the Boston Overlap Brace (BOB) represents a major refinement of the well-known Boston Brace System and was initially designed in response to the need for a bracing system to treat high school football players seen at Children's Hospital Medical Center in Boston. These young athletes suffered from a number of football-related back injuries, principally spondylolysis and spondylolisthesis. Initial clinical tests (on the football players, as well as on other sports participants with a variety of back injuries) showed the BOB to be effective in improving patient comfort and mobility in over 90% of the cases.

Further clinical research and development resulted in the BOB of today, which has proven to be a useful addition to the armamentarium of the physician managing back pain in the adult patient, and has provided relief from symptoms and increased mobility in a wide variety of cases.

INDICATIONS FOR USE OF THE BOSTON OVERLAP BRACE

Osteoporosis
Osteoarthritis
Spondylolysis
Spinal stenoisis
Spinal arthrosis
Dorsal hypnosis
Spondylolisthesis
Excessive lordosis
Spinal cord injury
Muscular dystrophy
Apophyseal fractures
Mechanical back pain
Compression fractures
Discogenic low back pain
Pre - and postoperative care
Wheelchair seating-positioning:
Cerebral palsy or mylomeningocele
Osteoporosis
Osteoarthritis
Spondylolysis
Spinal stenoisis
Spinal arthrosis
Dorsal hypnosis
Spondylolisthesis
Excessive lordosis
Spinal cord injury
Muscular dystrophy
Apophyseal fractures
Mechanical back pain
Compression fractures
Discogenic low back pain
Pre - and postoperative care
Wheelchair seating-positioning:
Cerebral palsy or mylomeningocele

OTHER USES OF THE BOSTON OVERLAP BRACE (BOB)

The BOB can be used in treating other orthopaedic problems, namely, post-operative stabilization following spine fusion. This is accomplished with a firm grip of the pelvis, achieved by a close fit to the ilium.

Cervical and thoracic supports may be adapted to the BOB by various attachments mounted to the thermoplastic material.

CHARACTERISTICS OF THE BOSTON OVERLAP BRACE

MATERIALS

The external shell is made of variable thickness thermoformed materials. It is durable, yet has enough flexibility to prevent fatigue failure. In most cases, the inherent strength of the material used, together with the multiple contours of the brace, provide sufficient rigidity for support. Braces for patients with severe problems usually require reinforcement of polyethylene models posteriorly. The durability of the thermoplastic material keeps the brace looking new much longer than the other materials. Specifically, the BOB is available in two thermoplastic materials:

Low density polyethylene.

Most BOBs are fabricated with this material.
Thicknessse offered range from 1/16 inch up to 3/16 inch, with 1/8 inch being the appropriate thickness for most patients.

Copolymer.

Offered in the 1/8 inch size and used where a greater degree of rigidity is required.
Optional liners are available in thermobonded foam.
The anterior closure of the BOB has been designed specifically to provide vital intra-abdominal pressure. Appropriate size "fronts" should be specified depending on the patients measurements – see p.13 for ordering information. Size of modules- the BOB is available in 16 sizes, designed to fitted most patients. "Special" order BOBs for those patients who cannot be fitted by one of the standard modules are also available – see p.13 for information on "specials".
When ordering BOBs for postoperative use, specify an untrimmed module in whatever size needed. This version of the BOB is left at a longer length than other BOBs.

DETAILS OF ANTERIOR CLOSURE

1. The anterior fasteners are Velcro closures backed with Dacron webbing.
   The width of the fasteners are 1½ inch or 2 inch wide, depending on the length of the anterior closure

2. The fasteners are double sewn into Dacron casing material to provide sufficient strength to the component part and to minimize the need for adjustments or repairs.

3. Pre-punched spring steel is inserted into the casings.

4. The anterior closure is secured to the brace with pop rivets. The rivet does not pass through the outer Dacron casing, thus preventing a metal-to-clothing contact. This enhances the cosmesis of the brace. Barrel nuts and screws may be substituted for pop rivets.

5. Nylon washers should be used with all 1/16 inch modules to prevent the material from pulling through the rivets.

ADAPTABILITY TO PATIENTS

The flexibility of the plastic makes a given size of module adaptable to different patients. By overlapping the anterior closure, it may be possible that the upper portion of the BOB overlaps more than the lower portion (and vice-versa), so that one module can fit several patients with different hip, waist and chest measurements. Refer to p. 17, "anterior overlap".

ACCEPTABILITY

To be effective, a brace must be worn. Many patients feel self-conscious in a visible metal and leather brace and will not wear one. Patients who will not tolerate a steel brace will usually accept a more readily concealed thin plastic brace. With the BOB, the problems of clothing being torn or chafed (as is often the case with metal and leather braces) are minimized.

The plastic gives a smoother outer contour, which allows clothing to hang more naturally; ordinarily a patient's normal clothing can still be worn.
Acceptability of the brace can be enhanced by appropriate exercises. Patients with a stiff lumbar lordosis will not take kindly to the lumbar flexion built into the module unless exercises are done. The firm abdominal pressure needed to gain lumbar flexion may make breathing difficult at first. This can be eased with appropriate breathing exercises.

NOMENCLATURE

In the past, the nomenclature for our brace had been vague. We initially called the brace "Anterior Boston Brace," out of respect for all those who worked with the Boston Scoliosis System. The vagueness was confusing, and therefore, for simplicity, we accepted the term which others applied to these braces. The correct nomenclature is the "Boston Overlap Brace" hereafter referred to as the "BOB."

ROUGH GUIDE - LORDOSIS

O°: Used mostly for juveniles and adolescents for flexible to semi-flexible spines.
15°: Used more often after age twenty (20) for semi-flexible to semi-rigid spines.
30°: Used to support excessive lordosis for patients who also have rigid spines or those suffering from Compression Fractures or Muscular Dystrophy.

There are a number of other thermoplastic prefabricated units available for rapid fabrication; some of these units differ in shape, adaptability and contours. More importantly, they differ in how the prefabricated unit is designed for an individual patient. Each system will have to be tried over time to determine the most effective way to manage patients. In order to clarify the relative merits of these various systems, it is important to identify the data collected with a specific brace. Consequently, it is very important when other brace units are used that they should not be called the "BOB." Only in this way can we avoid confusion.

PATIENT EVALUATION

THE PATIENT

Review the patient clinically. Note the suppleness of the spine. Are the shoulders and iliac crests level? If not, measure leg length for discrepancies. Are there any prominent boney areas that must be relieved of excessive pressure? Check the patient's tissue tone and postural habits. Evaluate the patient's attitude towards bracing.

It is important that the hamstring group and hip flexor group of muscles are checked for the degree of contracture. Soft tissue tightens up with age unless a vigorous exercise program is continued throughout the span of life. Because some adolescents have flexible spines, do not assume that certain muscle groups are not tight. Most children participating in sports are tight in certain muscle or muscle groups. If these muscles cannot be stretched either by gravity, wearing a brace, or physical therapy, then the lumbar lordosis must accommodate the contracture. Some patients will use their lumbar spine for movement in the hip joint and lower extremities. This must be analyzed fully before fabricating a brace.

With the patient sitting on a stool, distract the spine by elevating the axillas with your forearms, or let the patient elevate himself. At the same time, ask the patient to increase or decrease lordosis for the most comfortable position without pain. This is the position in which you should fabricate your initial brace. Any hip contractures about the pelvis must be considered – sitting versus standing. The iliac depression in conjunction with the total contact abdominal compression will distract the lumbar spine.Check that the iliac crests are level; if not, equalize leg lengths by a shoe lift or wedge.

PATIENT MEASUREMENT AND SELECTION OF AN APPROPRIATE BOSTON OVERLAP BRACE (BOB) MODULE

1. Fashion stockinette to the appropriate width and length to cover the patient, or use a cast shirt. The stockinette over the underwear preserves the patient's modesty and provides a sense of security.

2. Eliminate wrinkles in the stockinette or cast shirt after it is applied to the patient.

3. Ask the patient to lie down on a firm table, if possible, while measurements are being taken. Snug circumferential measurements are taken of the hips above the pubis, waist, and chest below the nipple line.

4. Select the module size from the size chart with reference to the patient's data sheet. A smaller size may be used on an obese patient to allow for displacement of tissue and a larger size on a patient with good muscle tone, since minimal tissue displacement within a month can be expected.

5. The waist measurement is most important and should be used first to determine the proper module size. Because of the flexibility of the material from which the modules are fabricated, the hip and chest circumferences can be 2 cm to 5 cm larger or smaller at the inferior and superior borders, i.e. the hips be smaller while the chest is larger, or vice versa.

6. In order to eliminate the patient's back pain, the proper sized module should have no void areas about the waist.

7. Determine that the module selected is long enough i.e. determine whether an "untrimmed" module should be used.

BRACE DESIGN ("THE BLUE PRINT")

The goal of brace design is to convert a prefabricated module useful for a number of patients to an individual orthosis fabricated for the specific needs of one patient.
In the manufacture of most objects, the availability of a "blue print" facilitates the transition between an abstract design and a finished product. In the same way, we feel that in the fabrication of a BOB, it is helpful for the orthotist to "blue print."
In the development of a "blue print" for a BOB, basic drafting principles are used and the brace outline is drawn on the standing lateral x-ray, when available, or drawn as a lateral silhouette of the patient. Consequently, not all patients need to have x-rays taken.
With technology soon to be generally available, we believe it will become common practice to have a wider, safer use of x-rays for more diagnostic procedures. It is therefore becoming imperative for the orthotist to be able to read x-rays.

DIMENSIONAL ANALYSIS:

Vertical and Horizontal

TRIM LINES:

Standard
Modification of the Standard

DIMENSIONAL ANALYSIS VERTICAL AND HORIZONTAL

To create a "blue print," an orthoist must do the following:

1. Draw a center line parallel to the side of the lateral x-ray or silhouette which passes through the body of S-2 perpendicular to its base.
2. Measure the lordosis and kyphosis curves by the Cobb Method.
3. Measure the vertebral wedging, if any.
4. Measure sacral angle (in relationship to floor) by the Cobb Method.
5. The normal curves of the spine are in perfect alignment when T-12, L-1 and T-1 bodies pass into this center of gravity line.
6. Information developed during the patient evaluation must be considered during this step.

SIZE CHART

TOTAL CONTACT MODULES

MOLD SIZES:

BOB Model	Hips		Waist		Chest	
Size	cm	inch	cm	inch	cm	inch
1	71	28	51	20	66	26
1-D	71	28	46	18	58.5	23
2	76	30	61	24	71	28
2-D	76	30	51	20	63.5	25
3	81	32	71	28	76	30
3-D	81	32	66	26	74	29
4	86.5	34	76	30	84	33
4-D	86.5	34	58.5	23	69	27
5	91.5	36	81	32	89	35
5-D	91.5	36	66	26	76	30
6	96.5	38	86.5	34	94	37
6-D	96.5	38	74	29	84	33
7	101.5	40	91.5	36	99	39
7D	101.5	40	81	32	91.5	36
8	109	43	96.5	38	109	43
8D	109	43	84	33	91.5	36
9	114	45	100	39	114	45
9D	114	45	87	34	94	37
10	117	46	104	41	117	46
10D	117	46	96	38	101	40

N.B. Standard sizes are shown above. "Special" BOBs will be fabricated on request. In these cases, furnish Allard Support UK with the patient's hip, waist and chest measurements, degree of lordosis required, and any other relevant information (e.g. weight) available.
The standard sizes have been designed to minimize the number of "specials" needed.
Orthotic facilities with considerable experience in fitting BOBs have found that by carrying a reasonable inventory of BOBs, they are able to meet nearly all their needs by minor adjustment to standard sizes.
Selection of an appropriate sized anterior closure or "front" is an important element in proper use of the BOB. Measurement of the patient (from groin to xyphoid) is the starting point; the top of the "front" should be at least 1" from the final anterior superior trim line. "Fronts" are available (in 1" increments) from 6" up to 12".

TRIM LINES

Lines are drawn on the module with a wax pencil to indicate where the plastic is to be cut away. These are referred to as the "trim lines". These trim lines are determined from the blue print x-ray or silhouette. The reference points used to transpose an x-ray or silhouette location to the module are the posterior limits of the iliac crest indentations.

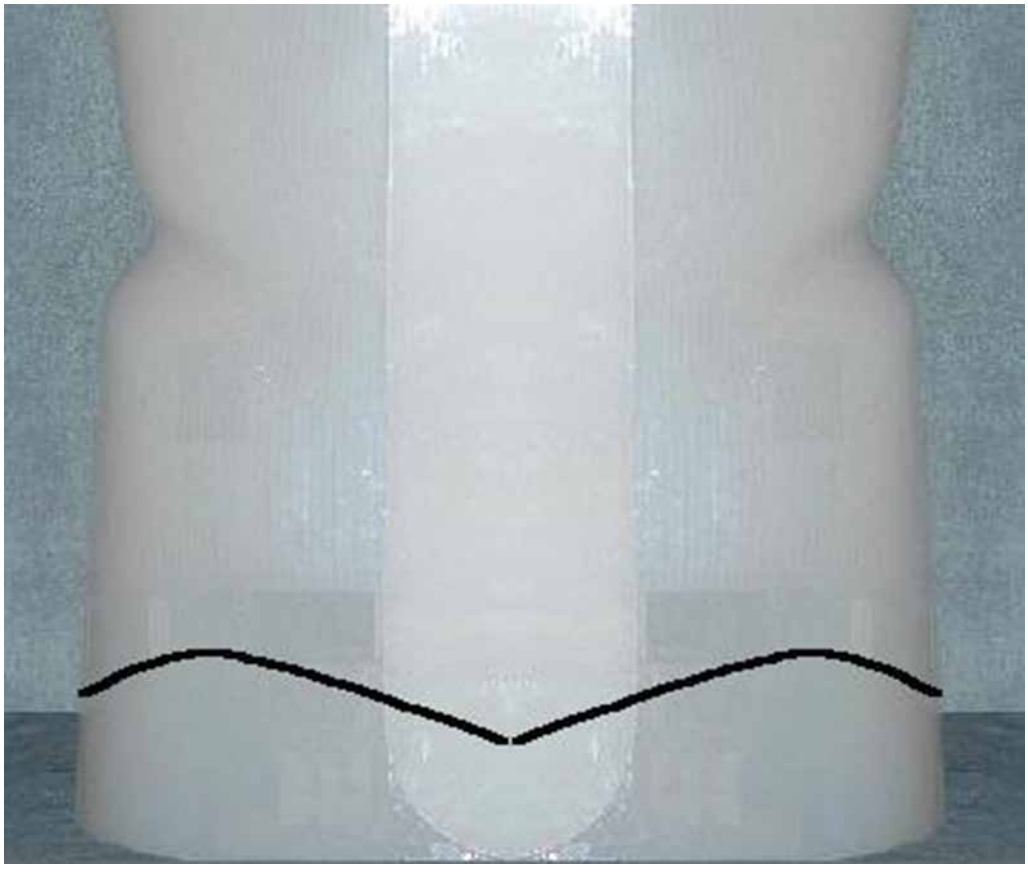
STANDARD TRIM LINES

Anterior Inferior

The anterior inferior trim line is kept as inferior as the patient can tolerate. For adolescents, the added length below allows for more growth without replacing the module and prevents the soft tissues from being pinched between the symphysis pubis and the brace.

The mid-point should extent over the pubis when the patient is standing. The trim lines for the thighs allow just 90° of flexion for sitting on a firm chair. Depress the patient's thigh by inserting one finger between the brace and thigh when the patient is sitting in this 90° position to determine whether the brace fits properly.

Note: the trim line for the thighs must be extended laterally to accommodate the proximal sartorius, for more comfortable sitting and to allow free rotation of the thigh at the hip.



LATERAL INFERIOR

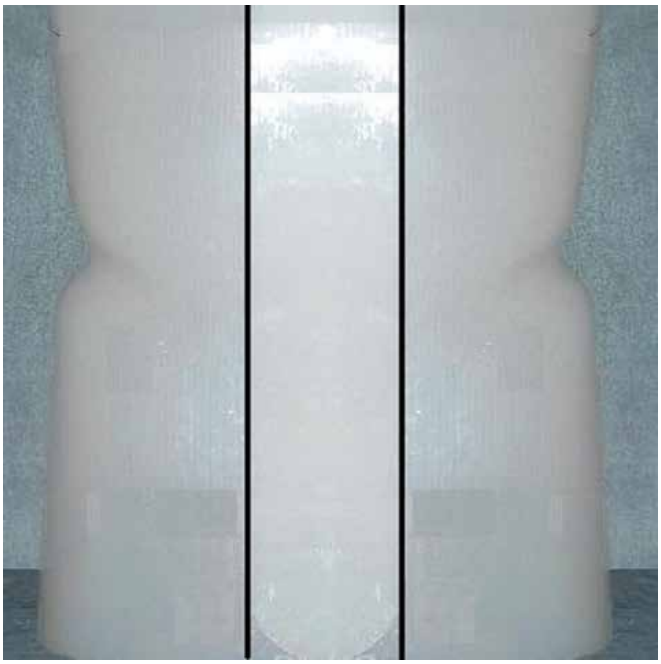
The standard lateral trim line flows from the anterior inferior line passing approximately 2cm above the top of the greater trochanters flowing down to the posterior inferior line.

POSTERIOR INFERIOR

The standard posterior inferior trim line extends as low as possible, but no more than one finger from the seat of a hard chair when the patient is sitting with hips flexed at 90°.
Establishing this line too high will result in increased lumbar lordosis and often unsightly bulges of soft tissue.

ANTERIOR OPENING

The anterior overlap should be not less than 1½" or more than 3" when the brace is complete i.e. the vertical closure should be ¾" to 1½" on either side of the midline when secured snugly on the patient. With the brace manually secured snugly on the patient, mark the position of the overlap by drawing a vertical line along the anterior edge of the plastic. The goal here is to achieve a final overlap that is vertical in places on the patient.



ANTERIOR SUPERIOR

The standard anterior superior trim line is located at the base of the sternum to prevent impingement upon the xyphoid processes.

POSTERIOR SUPERIOR

The standard posterior superior trim line originates at the level of the eight thoracic vertebras just inferior to the scapula. This height allows for a lever arm in the reduction of excessive lumbar lordosis. The trim line flows postero-laterally to the xyphoid process anteriorly.

MODIFICATION OF THE STANDARD TRIM LINES AND ADDITION OF OUTRIGGER

The trochanter extension is used for a patient with muscle spasms affecting balance.
A force is exerted by the trochanter extension of the brace to the greater trochanter of the patient to stabilize the patient in an upright position. An untrimmed module must be used in these cases.

Bilateral trochanter extensions are used to stabilize the pelvis and spine as a single unit for injury or after surgical intervention at the lumbar sacral junction. Thigh cuff outriggers may be added for additional support. For example, a hip spica. Again a "blank" module must be used.

STERNUM EXTENSION

A simple removable outrigger sometimes used in the case of kyphosis, round back, superior compression fractures and osteoporosis may be added to the BOB. This outrigger is removable and can be used full or part time. The patient should not be allowed to participate in contact sports while wearing this extension.

GERIATRIC SCOLIOSIS AND POST-OP

Follow the Boston Scoliosis Manual trim lines, except this anterior brace is not to be considered corrective, but rather a holding and supportive brace. Used post-operatively with or without instrumentation, for geriatric patients. The "blank" module should be used in these cases.

FABRICATION OF THE BRACE

Remove any excess plastic as marked

1. Use scissors for 1/16" polyethylene, a sabre saw for polypropylene and an edge trimmer for 1/8" or thicker polyethylene.

2. Establish smooth flowing lines by using a belt sander. Fine sanding is necessary to prevent nicks which can lead to fatigue of the thermo-plastic material. All edges should be sanded at right angles to the surface of the material. A router with a fine grit cone, grit cone or a flexible shaft with a fine grain metal burring head can be used for fine sanding; most practitioners prefer a felt cone for polyethylene BOBs.

3. Shape spring steel anterior closure (at the end where the holes are farthest apart) to the desired degree, i.e. so that the closure will lie flat against the brace without gapping.

Next, secure overlap with clamps. Set the closure on the brace, with the edges of the closure equidistant from the center of the overlap. Secure the middle holes to brace with pop rivets.

With a pencil, mark the location of the other holes to be drilled. Remove the brace from the patient; turn it inside out. The pencil marks can be seen from the inside of and unlined brace, the top and bottom holes on each side can now be drilled and the closure secured to the brace with pop rivets.

REINFORCEMENT OF THE BRACE:

After the brace is completely finished, posterior reinforcements can be pop-riveted to the girdle. The manner in which these reinforcements are applied can change the shape of the brace for better or worse.

FITTING OF BRACE

INITIAL PATIENT FITTING

1. With the patient lying on one side with knees flexed slightly, slip the module around the body and position properly. The patient can now roll onto his back.
2. Exert medial force on the module with your hands and force down the iliac crests.
3. The anterior opening should be overlapped not less than two, or more that five inches at top or bottom, but not both.

FINAL FITTING

When 0° lordosis brace is properly tightened, the patient should be forced to stand with lumbar spine flexed and will probably complain of being thrown forwards.
This is what you want to achieve i.e. complete reduction of the lumbar lordosis.
If hip flexors are too tight and the patient is thrown forward too much, it may be wise to increase lordosis by adding pre-shaped posterior spinal spring steel uprights. Selection of a module with 15° lordosis will normally solve the problem with the older patients.

1. There should be no impingement of normal flexion or rotation of the hip joints.
2. The brace should be able to prevent any movement within. If vertical overlap trim lines are not correct reposition the anterior closure steels and trim excess. If too small, change to new module.
3. The costal margins at the ribs and groin areas of the brace are carefully examined to make sure no undue force is placed on the edges. The edges must be rolled for comfort.

AERATE BRACE:

In some parts of the world any apparel is uncomfortable due to extreme heat and with the wearing of an appliance it becomes intolerable. Aerating the pelvic brace will make the brace tolerable in most areas.

a. No holes should be placed within 2cm of the edges of the brace

b. In high stress areas of the brace fewer holes are drilled.

FOLLOW UP; FITTING COMPLICATIONS:

During follow-up, various adjustments may be necessary for continued pain-free success.
Experience in the field with BOB indicates that, in most cases where a patient reports that the brace has failed to relieve pain, the proper placement of posterior reinforcements (adjusting the precise shapes by using a "trial and error" method) will solve the problem.
Where the brace becomes loose on the patient because of tissue or weight loss, reset the anterior closure more laterally, and/or add a liner.
Addition of a belly pad often creates better anterior-posterior control, and relieves pressure on anterior superior spaces, thus accommodating pelvic extension or tight hip flexors.
Soft polyethylene foam may be cemented in posteriorly for sensitive boney prominences for patient comfort.
Trochanter pads may be needed to control sacral fixation or fusions thus an untrimmed module must be used initially.
Most patients – particularly elderly patients prefer Velcro fasteners on the anterior closures, but optional strap-and-buckle fasteners are more durable.
A number of patients have reported that when driving or riding in a car, use of a board underneath improves comfort.

A SPECIAL NOTE REGARDING THE 0° BOB.

The 0° BOB has been carefully designed to provide the proper total contact and support for patients requiring this model based on the "blueprint" developed. Given the length of the unmodified brace, it will not appear perfectly flat before it is fit on the patient – a perfectly flat module tends to "gape" around a patient's buttocks and axillas.

ADDENDUM – PATIENT HYGIENE

CLEANING THE BRACE

The patient's BOB (both the brace itself and the optional liner, if provided) should be cleaned daily with soap and water, and thoroughly rinsed. A terrycloth towel can be used to dry the liner; the brace will dry by itself within 30 minutes. If the brace is needed quickly, it can be dried with a hair dryer on a cool setting – it is important that no heat is used.

SKIN CARE:

It is important to prevent skin breakdown i.e. sore, red and raw skin. The skin under the brace needs to be toughened.

To protect the skin, the patient should:

1. Bathe daily (bath or shower)
2. Apply rubbing alcohol to all parts of the skin that the brace covers, especially where the skin is pink. This is done in order to toughen the skin.
3. Avoid the use of creams, lotions, or powder under the brace – they soften the skin.
4. Observe skin frequently when the brace is first used, looking for discolored areas.
5. Always wear 100% cotton undershirt or t-shirt under the brace; these should be tubular knit without side seams. Danskin makes a white cotton body suit of stretch material that is good.

USE OF THE MODIFIED BOSTON BRACE SYSTEM (B.O.B.) FOR BACK PAIN: CLINICAL INDICATIONS, 1985

BY: LYLE J. MICHELI, M.D.

INTRODUCTION

The development of pre-fabricated thermoplastic braces to aid in the treatment of spinal deformity -especially scoliosis-is a recent phenomenon. The first such system, the Boston Brace System, was introduced only 10 years ago. The efficacy and high patient acceptance of these semi-rigid, closely fitting orthoses resulted in a reassessment of the use of back braces for spinal disorders, in general. While a number of back braces were used-in the past-for a variety of back disorders causing back pain, their use had fallen into disrepute in recent years. There appeared to be a number of quite different factors responsible for this - ranging from theoretical concerns about their effect on the long term function and physiology of the back, to poor patient acceptance and compliance.

These braces, which included the Norton Brown, Jewett hyperextension, and chair-back braces, were most commonly prescribed for patients complaining of back pain from a number of very different etiologies. Unfortunately, careful determination of the back pain - whether due to disc disease, arthrosis of the facet joint, spinal stenosis or spinal deformity, was most often not done, and braces were prescribed indiscriminately, reflecting the ignorance of both brace prescriber and brace fabricator as to the cause of pain being treated and the expected effect of the orthosis on the spinal column and its primary disease process.

In addition, these braces were often prescribed without concurrent exercise programs - with resultant loss of spinal motion and strength and, sometimes, further exacerbating the back pain when the brace was removed. Finally, these older braces were often bulky, metal and leather constructs with a limited number of contact sites on the torso and pelvis. Wearers of these braces often complained of the brace being uncomfortable, at best, and these braces sometimes were not accepted or worn by the patient. Patient compliance was usually low.

Most of the thermoplastic orthoses developed to treat spinal deformities in children or adolescents incorporated, as a design feature, a forward flexion of the orthosis – designed to reduce lumbar lordosis, flatten the back, and increase the torso contact and efficacy, of the derotation pads placed at the convexities of the curve, or curves.

In certain cases, this anti-lordotic feature itself was used to treat children with excessive lumbar lordosis when this was a primary spinal deformity. These conditions included cleidocranial ostosis, achondroplastic dwarfism, and in some instances, idiopathic hyperiordosis. These early cases confirmed the efficacy of this brace design in mechanically decreasing lumbar lordosis. Another clinical application of this anti-lordotic feature the Boston Brace system soon became evident. Back pain in athletically active youngsters - although due to a variety of etiologies - including spondylolysis, apophyseal fracture, disc disease, or back strain, appeared to have as a common etiologic feature hyperlordoisi of the lumbar spine - either in the occurrence of injury, or in its persistence.

The potential for effective treatment of back pain in athletically active children and adolescents with thermoplastic orthoses was confirmed by extensive clinical trials. In the process, certain aspects of the brace design were changed, and clinical indications were refined.

The original braces were posterior opening and constructed of polypropylene with semi-rigid 1/4" polyethylene liners. A number of different designs of the back pain brace were subsequently tried. The present unlined, anterior opening polyethylene with reinforced spring steel - the B.O.B. brace - is the culmination of these clinical investigations. At the present time, this brace is available in either polyethylene in 1/16", 1/8" or 3/16" thickness, or polypropylene in 1/8" thickness. This brace is usually prescribed unlined. The brace is available in contours of 0 degrees, 15 degrees or 30 degrees, of lumbar lordosis.

The efficacy and high rate of acceptance of these thermoplastic braces for back pain in these young athletics - particularly in spondylolysis - served as an incentive for thermoplastic bracing in a variety of other back disorders-including low back and upper back pain in adults. Experience with this application of thermoplastic total contact bracing has proven promising. While this experience is more recent, and study is needed to determine the long term efficacy and effect on the natural history of back pain in adults, the short term observations, in and of themselves, are adequate basis for our own continued use of this technique.

Use of the thermoplastic braces, although only one part of a comprehensive treatment regimen, can often prove decisive in restoration of function - allowing an executive with discogenic back pain to return to work or a geriatric woman with incapacitating arthritic back pain to resume light housework.

DISCOGENIC LOW BACK PAIN

Discogenic back pain, with or without sciatica, can often be improved with the addition of thermoplastic bracing to the treatment regimen. Analgesics, muscle relaxants, and exercises to reduce lumbar lordosis, as well as periods of strict bed rest, are time honored components of disc management. The use of a back orthosis to not only to maintain immobilization of the back, but also to help maintain an anti-lordotic posturing of the back when the patient is erect, has proven useful in many of our patients with disc pain. It is noteworthy, however, that most adults cannot tolerate the full 0 degree lordosis brace. The brace with 15 degree lordosis has proven most helpful, and in some cases the 30 degree lordosis brace may be necessary.

Some insight into the particular brace design to be used in a given patient can be gained by manually posturing the patient into more or less lordosis, while standing, and observing the effect on the back or leg pain.

The patient with an acute, incapacitating attack of discogenic back pain cannot be fitted for this brace, of course, and usually must be treated with bed rest initially. However, after the acute pain and spasm have diminished, brace fitting and use can often speed return to function.

This brace fitting is often particularly useful when sciatic scoliosis is associated with the back pain - as it reduces the decompensation of the spine resulting from the sciatic scoliosis and seems to break the cycle of pain and spasm associated with it.

Brace use is continued until full painless function is restored. This may be as soon as 12-14 weeks, but a more usual period of bracing is 4-6 months. The use of a daily physical program of directed physical therapy - to restore the strength and motion back – is essential. If the patient attains a comfortable and functional improvement with the brace, but has resumption of pain when the brace is tapered, further diagnostic evaluation and possibly more aggressive therapy such as laminectomy or chymopapain injection may be required.

By experience some patients with chronic intermittent discogenic back pain and sciatica reach the point where they have significant improvement in function and they will use their brace intermittently for particular episodes of back pain following strenuous activity. This will often involve use of the brace at night and while up and about working for a period of 2-3 days.

SPINAL ARTHOSIS

Some of the most gratifying results of brace treatment for low back pain are in patients with extensive arthrosis of the lumbar spine.

As with other arthrosis or arthritis, anti-inflammatory medications are often important components of the treatment program. However, during the sub-acute period of rehabilitation and restoration of function, bracing can indeed by useful. Once again, patients will not usually be able to tolerate the full 0 degree lordosis but are generally and most effectively treated with a 15 degree of lumbar lordosis brace. It is essential to be in a progressive exercise program in conjunction with the bracing as soon as possible.

Most of these patients have dramatic tightness of the lumbo-dorsal fascia and hamstrings and must be on a good anti-lordotic and good exercise program to restore the flexion and the extension of the lumbar spine and the addition of the flexibility of the lower extremities. In these patients, Williams type exercises alone may have to be supplemented by the McKensic flexion type exercises to restore the full range of motion and strength of the spine.

It must be explained to the patient that the brace is really an adjunct in the restoration of function to his back. It, once again, can be very useful for the first 2-3 months after an acute episode of back pain but then is used to help support the back while instituting a progressive exercise program. In addition, it can be extremely helpful to have the brace on hand for recurrent episodes of back pain and spasm.

SPONDYLOLYSIS

As in the adolescent with acute spondylosis, a bracing and exercise program can often significantly help the adult with more chronic spondylolysis.

This adult often has had this condition for a number of years and has associated arthrosis and, sometimes, frank neurologic impingement at this level of spine. He or she may not be able to be placed initially in a full 0 degree of lordosis brace. We will often begin with a 15 degree of lordosis brace and then contour it into 0 degrees after 2-3 months.

If the patient is able to retain a very nice level of comfort and function while in the brace but has resumption of back pain whenever they begin to taper from the brace extensively, this may be considered an indication for surgical stabilization of the spondylolysis level.

Use of the anti-lordotic brace, in particular, seems to be useful in those patients who have a component of sciatica with a spondylitic level.

COMBINED DORSAL KYPHOSIS AND LORDOSIS

Patients with tightness in the spine in association with a dorsal kyphosis and lumbar lordosis deformity often will have intermittent episodes of mechanical back pain localized to the mid-dorsal area of the spine, thoracolumbar junction, or low back. The characteristic clinical picture is that of a patient who is rather dramatically tight in the low back and hamstrings and can often not get within 2' of the floor on forward bending. Brace immobilization, of course, will in no way restore motion to the spine but the use of the brace for the painful episode often dramatically facilitates the relief of pain and the restoration of motion. In addition, the reduction of lumbar lordosis within the 15 degree brace and performing dorsal extension exercises can be useful in helping to reduce, at least in part, the spinal deformity.

We have found this particularly useful in post-menopausal females with osteopenia as a component progressive deformity. In some cases, we will use an additional anterior strut to apply anterior chest pressure and help stabilize the upper back until comfort has been obtained. The relief of pain, which is the direct result of brace use, can then be used to facilitate the progressive rehabilitation of the patient with exercises and activity. The patient should be referred to an appropriate rheumatologist or internist to discuss possible nutritional components of the management of their primary osteopenia. However, it has been well demonstrated that one of the most important components of maintaining bone structure is restoration of exercise and function. The relief of pain and the stabilization of the spine facilitated by the bracing is often a first important step in the restoration of strength and function to the torso and spinal column

POST OPERATIVE USE OF THE BRACE.

Thermoplastic bracing can also be used in the post-operative period in a number of situations involving spinal surgery. We use a B.O.B. with 15 degrees of lumbar lordosis following fusion for spondylolysis, or any low back fusion in which the basically normal contour of the spine is expected following attainment of fusion. Bracing is not usually required following simple dissections or chymopapain injection.

ABOUT US

Allard Support UK Ltd (previously Boston Brace Europe Ltd), continue to manufacture and promote the original Boston Brace product range, which provide a proven philosophy based on the foundation of evidence based medicine and vigorously supported by education and training. Today, Allard Support UK Ltd supplies the Original Boston product range directly to our customers in the UK and through our distribution partners in Europe, Japan, Korea, India, and many other countries. Visit www.allarduk.co.uk for information on distributors and our product range.

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