BRYAN® CERVICAL DISC

Implant package contents (disc assembly and seal plugs) provided sterile. Unless marked as sterile, instrument set contents provided non-sterile.

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ENGLISH

IMPORTANT INFORMATION ON THE BRYAN® CERVICAL DISC

DESCRIPTION

The BRYAN® Cervical Disc is a cervical disc replacement device comprised of the following components: two titanium shells, two titanium retaining wires, a polycarbonate polyurethane nucleus, a polyether polyurethane sheath, and two titanium seal plugs. The articulating surfaces of the device are polyurethane and titanium.

The nucleus is designed to fit between the two shells. The bone-contacting side of each shell includes a sintered titanium porous coating to provide for bony ingrowth. The nucleus-contacting side of each shell has a center pin which interacts with a central hole in the nucleus to control the range of motion and help prevent nucleus expulsion. A stop or wing on the anterior aspect of the device, which extends superiorly on the cephalad shell and inferiorly on the caudal shell, is intended to prevent migration of the device into the spinal canal. A polyurethane sheath surrounds the nucleus and is attached to each shell with titanium retaining wires, forming a closed compartment. The device is supplied pre-assembled with the exception of saline and two seal plugs. Prior to implantation, the surgeon fills the BRYAN® Cervical Disc with sterile saline. The saline is intended to function as an initial lubricant for the prosthesis. The surgeon screws titanium alloy seal plugs into one hole in each shell to initially retain the saline.

The prosthesis is held in the intervertebral disc space by the fit of each shell's outside diameter and convex outer surfaces into a custom-milled cavity created in each vertebral endplate by the surgeon prior to device implantation. The prosthesis was designed to allow for the following motions from the neutral position *ex vivo*: approximately ±11° flexion/extension, ±11° lateral bending, ±7° rotation, and ±1 mm translation for all cervical disc sizes.

The available components are shown in the table below.

Table 1. BRYAN® Cervical Disc Device Sizes.

Catalog Number	Diameter (mm)
6470314	14
6470315	15
6470316	16
6470317	17
6470318	18

After implantation of the device, the resultant interbody height is approximately 6mm.

Implied warranties of merchantability and fitness for a particular purpose or use are specifically excluded. See the MDT Catalog or price list for further information about warranties and limitations of liability.

INDICATIONS

The BRYAN® Cervical Disc is indicated in skeletally mature patients for reconstruction of the disc from C3-C7 following single-level discectomy for intractable radiculopathy and/or myelopathy. The BRYAN® device is implanted via an open anterior approach. Intractable radiculopathy and/or myelopathy is defined as any combination of the following: disc herniation with radiculopathy, spondylotic radiculopathy, disc herniation with myelopathy, or spondylotic myelopathy resulting in impaired function and at least one clinical neurological sign associated with the cervical level to be treated, and necessitating surgery as demonstrated using computed tomography (CT), myelography and CT, and/or magnetic resonance imaging (MRI). Patients receiving the BRYAN® Cervical Disc should have failed at least six weeks of non-operative treatment prior to implantation of the BRYAN® Cervical Disc.

CONTRAINDICATIONS

The BRYAN® Cervical Disc should not be implanted in patients with the following conditions:

- Active systemic infection or infection at the operating site;
- Allergy to titanium, polyurethane, or ethylene oxide residues;
- Osteoporosis defined as a DEXA bone mineral density T-score equal to or worse than -2.5;
- Moderate to advanced spondylosis characterized by bridging osteophytes, marked reduction or absence of motion, or collapse of the intervertebral disc space of greater than 50% of its normal height;
- Marked cervical instability on radiographs (e.g., radiographic signs of subluxation greater than 3.5 mm or angulation of the disc space more than 11 degrees greater than adjacent segments);
- Significant cervical anatomical deformity or compromised vertebral bodies at the index level (e.g., ankylosing spondylitis, rheumatoid arthritis, or compromise due to current or past trauma);
- Significant kyphotic deformity or significant reversal of lordosis; or
- Symptoms necessitating surgical treatment at more than one cervical level.

ADVERSE EVENTS

A multi-center, prospective, randomized, non-inferiority clinical trial of the BRYAN® Cervical Disc was conducted in the United States comparing the anterior spinal use of the BRYAN® device to anterior cervical discectomy and fusion (ACDF) using allograft and plating stabilization, the control, for reconstruction of the disc from C3-C7 following single-level discectomy for intractable radiculopathy and/or myelopathy. The adverse effects, as shown in Table 2 below, were reported from the 242 BRYAN® disc patients and 221 control patients enrolled in the multi-center clinical study. Adverse event rates presented are based on the number of patients having at least one occurrence for a particular adverse event divided by the total number of patients in that treatment group. Patients experiencing adverse events in more than one category are represented in each category in which they experienced an adverse event. At the time Tables 2 and 2b below were compiled, all patients had reached the 12-month follow-up visit, and 207 investigational and 175 control patients had 24-month follow-up information. As shown in Table 2b, a minority of the adverse events were deemed related to the study treatment. Relationship determinations were approved by a physician reviewer.

Table 2. Adverse Events in US IDE Study.[1, 2]

Complication	Surgery		Postoperative (1 day - <4 Weeks)		6 Weeks (≥4 Wks - <9 Weeks)		3 Months (≥9 Wks - <5 Months)		6 Months (≥5 Mos- <9 Months)		12 Months (≥9 Mos- <19 Months)		24 Months (≥19 Mos- <30 Months)		# of Patients Reporting & Total adverse events	
	Inves.	Control[3]	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Investig. # Patients (% of 242) Total # Events	Control # Patients (% of 221) Total # Events
Anatomical/Technical Difficulty	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0 (0.0) 0	1 (0.5) 1
Cancer	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2 (0.8) 2	0 (0.0) 0
Cardiovascular	0	0	1	0	0	0	1	1	0	0	0	1	2	0	4 (1.7) 4	2 (0.9) 2
Carpal Tunnel Syndrome	0	0	0	1	3	0	2	1	3	1	2	1	2	0	12 (5.0) 12	4 (1.8) 4
Death	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0 (0.0) 0	1 (0.5) 1
Dysphagia/Dysphonia	10	1	15	15	3	3	0	1	0	0	0	0	0	0	26 (10.7) 28	19 (8.6) 20
Dysphagia	9	1	5	12	1	2	0	1	0	0	0	0	0	0	15 (6.2) 15	16 (7.2) 16
Dysphonia	1	0	10	3	2	1	0	0	0	0	0	0	0	0	13 (5.4) 13	4 (1.8) 4
Gastrointestinal	0	2	2	0	0	1	1	1	4	1	0	1	5	0	9 (3.7) 12	6 (2.7) 6
Infection	0	0	8	2	4	1	1	0	2	1	2	2	1	4	17 (7.0) 18	10 (4.5) 10
Superficial	0	0	5	1	2	0	0	0	0	0	0	0	0	0	7 (2.9) 7	1 (0.5) 1
Deep Wound	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0.0) 0	0 (0.0) 0
Other Non-Wound Related	0	0	3	1	2	1	1	0	2	1	2	2	1	4	10 (4.1) 11	9 (4.1) 9
Malpositioned Implant	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2 (0.8) 2	0 (0.0) 0
Neck and/or Arm Pain	1	0	20	14	31	23	23	28	29	20	28	22	8	21	115 (47.5) 140	98 (43.4) 128
Neck Pain	0	0	10	7	13	14	6	17	16	7	12	9	2	8	59 (24.3) 59	60 (27.1) 62
Arm Pain	1	0	8	5	11	4	8	5	11	6	11	9	4	8	54 (22.3) 54	37 (16.7) 37
Neck and Arm Pain	0	0	2	2	7	5	9	6	2	7	5	4	2	5	27 (11.2) 27	29 (13.1) 29
Neurological	0	1	8	5	6	9	16	8	8	10	16	12	7	5	48 (19.8) 60	46 (20.8) 50
Upper Extremity	0	1	5	5	4	9	13	7	7	9	15	10	6	5	50 (20.7) 50	46 (20.8) 46
Lower Extremity	0	0	3	0	1	0	2	1	1	1	0	1	1	0	8 (3.3) 8	3 (1.4) 3
Neurological (both)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1 (0.4) 1	0 (0.0) 0
Neurological (non-specific)	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1 (0.4) 1	1 (0.5) 1
Non-Union	0	0	0	0	0	0	0	1	0	2	0	1	0	1	0 (0.0) 0	5 (2.3) 5
Other[4]	7	6	19	7	11	5	7	5	11	10	15	5	14	9	59 (24.4) 84	39 (17.6) 47

[1] Based on 24-month cohort at time of interim analysis as pre-specified in IDE protocol.

[2] Some adverse events may lead to additional surgeries or interventions. Please refer to Table 4 for more information.

[3] Control=Single-level anterior interbody fusion procedure with allograft and plate stabilization.

[4] Other consists of various events that do not fit into another category, such as rash, depression, or hypertension. This category also consists of three events related to an investigator's report of lack of motion of the prosthesis. A formal evaluation of heterotopic ossification was not included in the IDE protocol.

Complication	Surgery		Postoperative (1 day - <4 Weeks)		6 Weeks (≥4 Wks - <9 Weeks)		3 Months (≥9 Wks - <5 Months)		6 Months (≥5 Mos - <9 Months)		12 Months (≥9 Mos - <19 Months)		24 Months (≥19 Mos - <30 Months)		# of Patients Reporting & Total adverse events	
	Inves.	Control[3]	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Inves.	Control	Investig. # Patients (% of 242) Total # Events	Control # Patients (% of 221) Total # Events
Other Pain[5]	0	0	7	4	6	7	11	13	10	7	9	8	13	8	49 (20.2) 56	44 (19.9) 47
Pending Non-Union	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0 (0.0) 0	5 (2.3) 5
Respiratory	0	0	3	4	1	0	0	2	0	0	0	0	0	0	4 (1.7) 4	6 (2.7) 6
Spinal Event[6]	1	0	1	1	2	4	6	2	1	5	6	7	6	6	21 (8.7) 23	20 (9.0) 25
Cervical	1	0	0	1	1	2	2	2	0	2	4	1	3	4	11 (4.5) 11	12 (5.4) 12
Non-Cervical	0	0	1	0	1	2	4	0	1	3	2	6	3	2	12 (5.0) 12	13 (5.9) 13
Trauma	1	0	2	2	2	2	5	4	10	5	14	7	8	7	34 (14.0) 42	22 (10.0) 27
Urogenital	0	0	0	0	0	0	0	1	2	0	4	2	2	0	6 (2.5) 8	3 (1.4) 3
Vascular Intra-Op	2	1	0	2	0	0	0	0	0	0	0	0	0	0	2 (0.8) 2	3 (1.4) 3
Any Adverse Event															202 (83.5)	174 (78.7)

Table 2b. Adverse Events Classified as Device-Related or Device/Surgical Procedure-Related in US IDE Study.[1]

Complication	Surgery		Postoperative (1 day - <4 Weeks		6 Weeks (≥4 Wks - <9 Weeks)		3 Months (≥9 Wks - <5 Months)		6 Months (≥5 Mos - <9 Months)		12 Months (≥9 Mos - <19 Months)		24 Months (≥19 Mos - <30 Months)		# of Patients Reporting & Total adverse events	
	Invest.	Control[3]	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest. # Patients (% of 242) Total # Events	Control # Patients (% of 221) Total # Events
Malpositioned Implant	1*	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (0.4) 1	0 (0.0) 0
Neck and/or Arm Pain	0	0	0	0	1*	1*	1*	0	0	0	0	0	0	0	2 (0.8) 2	1 (0.5) 1
Neck Pain	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0 (0.0) 0	1 (0.5) 1
Neck and Arm Pain	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2 (0.8) 2	0 (0.0) 0
Non-Union	0	0	0	0	0	0	0	1*	0	2*	0	1*	0	1*	0 (0.0) 0	5 (2.3) 5
Other	0	0	0	0	0	0	0	0	1	0	1	0	1	0	3 (1.2) 3	0 (0.0) 0
Pending Non-Union	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0 (0.0) 0	5 (2.3) 5
Spinal Event	0	0	0	0	0	0	0	0	0	0	0	0	0	1*	0 (0.0) 0	1 (0.5) 1
Cervical	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0 (0.0) 0	1 (0.5) 1
Trauma	0	0	0	0	0	0	0	0	1*	0	0	0	0	0	1 (0.4) 1	0 (0.0) 0

[5] Other Pain consists of non-neck and/or arm pain events such as headache, lower back pain, or leg pain.
[6] Spinal event consists of events reported as a spinal diagnosis/disorder, e.g., degenerative disc disease, disc herniation, stenosis, scoliosis.

	Surgery		Postoperative (1 day - <4 Weeks)		6 Weeks (≥4 Wks - <9 Weeks)		3 Months (≥9 Wks - <5 Months)		6 Months (≥5 Mos - <9 Months)		12 Months (≥9 Mos - <19 Months)		24 Months (≥19 Mos - <30 Months)		# of Patients Reporting & Total adverse events	
Complication	Invest.	Control[3]	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest. # Patients (% of 242) Total # Events	Control # Patients (% of 221) Total # Events
Any Adverse Event															7 (2.9)	12 (5.4)

* denotes WHO Grade 3 or 4 serious adverse events.

One death occurred in a control group patient. The reported death was due to injuries sustained in a motor vehicle crash approximately 17 months postoperatively and was not considered to be associated with the control group implant or implantation procedure.

In addition to the data available at the time of the initial analysis, data subsequently collected from approximately 110 patients at 5 years (60 months) postoperatively revealed one additional death in a control patient. The patient was a 48-year-old male and the causality of death is unknown. This information is not included in Table 2.

A Bayesian analysis was conducted on adverse events using non-informative priors. The results are presented in Table 3.

Table 3. Bayesian Comparison of Adverse Events.

Adverse Event	Posterior Adverse Event Rate		There is a 95% probability that adverse event rates will fall within the following range		Probability that the adverse event rate of investigational group is lower than that of the control group (%)
	Inves.	Control	Inves.	Control	
Anatomical/Technical Difficulty	0.000	0.005	0.0% to 1.2%	0.0% to 2.1%	77.3
Cancer	0.008	0.000	0.1% to 2.6%	0.0% to 1.3%	14.2
Cardiovascular	0.017	0.009	0.5% to 3.8%	0.1% to 2.9%	26.4
Carpal Tunnel Syndrome	0.050	0.018	2.7% to 8.2%	0.8% to 4.2%	3.5
Death	0.000	0.005	0.0% to 1.2%	0.0% to 2.1%	77.3
Dysphagia/Dysphonia	0.107	0.086	7.3% to 15.0%	5.4% to 12.8%	22.2
Gastrointestinal	0.037	0.027	1.8% to 6.6%	1.1% to 5.5%	28.3
Infection	0.070	0.045	4.3% to 10.7%	2.2% to 7.8%	13.1
Malpositioned Implant	0.008	0.000	0.1% to 2.6%	0.0% to 1.3%	14.2
Neck and/or Arm Pain	0.475	0.434	41.4% to 53.9%	37.2% to 50.1%	19.0
Neurological	0.198	0.208	15.2% to 25.2%	15.8% to 26.4%	60.4
Non-Union	0.000	0.023	0.0% to 1.2%	0.8% to 4.8%	98.9
Other	0.244	0.176	19.3% to 30.1%	13.1% to 23.0%	3.9
Other Pain	0.202	0.199	15.5% to 25.5%	15.1% to 25.5%	46.6
Pending Non-Union	0.000	0.023	0.0% to 1.2%	0.8% to 4.9%	98.9
Respiratory	0.017	0.027	0.5% to 3.8%	1.1% to 5.4%	77.7
Spinal Event	0.087	0.090	5.5% to 12.6%	5.7% to 13.3%	55.8
Trauma	0.140	0.100	10.0% to 18.8%	6.8% to 14.4%	9.1
Urogenital	0.025	0.022	1.0% to 5.0%	0.3% to 3.6%	20.9
Vascular Intra-Op	0.008	0.014	0.1% to 2.6%	0.3% to 3.8%	69.9
Any adverse Event	0.835	0.787	78.4% to 87.7%	72.9% to 83.6%	9.7

Table 4 summarizes the secondary interventions in the BRYAN® device and control treatment groups. Revisions, removals, and supplemental fixations occurring at or before the 24-month follow-up visit were considered second surgery failures in the clinical study. Reoperations were not considered second surgery failures in the study. Table 4 also presents the Bayesian statistical comparison of secondary surgeries between the BRYAN® device and control treatment groups. For these safety comparisons, probabilities exceeding 97.5% are considered statistically significant, rather than the 95% criterion used for other endpoints.

Table 4. Secondary Interventions and Surgical Procedures.

	Surgery		Postoperative (1 day - <6 Weeks)		6 Weeks (≥6 Wks - <3 Months)		3 Months (≥3 Mos - <6 Months)		6 Months (≥6 Mos - <9 Months)		12 Months (≥9 Mos - <19 Months)		24 Months (≥19 Mos - <30 Months)		30 Months (≥30 Mos - <40 Months)		Total ≤24 Months		Probability that the second surgery rate of investigational group is lower than that of the control group (%)
	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest.	Control	Invest. # Patients (% of 242) Total # Events	Control # Patients (% of 221) Total # Events	
Revisions	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1* (0.4) 1	0 (0.0) 0	27.3
Removals	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0	0	3** (1.2) 3	2*** (0.9) 2	38.6
Reoperations	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	2**** (0.8) 2	1 (0.5) 1	34.6
Supplemental Fixations	0	0	0	0	0	0	0	1	0	1	0	1	0	3	0	1	0 (0.0) 0	5 (2.3%) 6	98.9
Other – Cervical Adjacent Level	0	0	0	0	0	0	2	0	0	0	3	1	1	4	1	0	7 (2.9) 7	4 (1.8) 5	N/A
Other – Cervical Non-Adjacent Level	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	1	1 (0.4) 1	4 (1.8) 4	N/A

* Revision procedure due to malpositioned implant after wound closure at surgery.
** Removals attributed to residual pain (2) and trauma (1).
*** Removals attributed to non-unions.
**** Both of the two reoperations occurred within 1 month of the 12-month postoperative timepoint. One of these reoperations was due to stenosis with radiculopathy, and the other resulted from pain and numbness following a motor vehicle accident.

Additionally, data from approximately 110 patients at 5 years (60 months) postoperatively revealed one additional removal of a BRYAN® Cervical Disc not accounted for in Table 4. This patient presented with increased neck and arm pain at the 5-year visit. The BRYAN® Cervical Disc was explanted, a two-level fusion procedure performed, and the patient recovered well.

POTENTIAL ADVERSE EVENTS

Risks associated with the use of the BRYAN® Cervical Disc include: 1) those commonly associated with any surgery; 2) those specifically associated with cervical spinal surgery using an anterior approach; and 3) those associated with a spinal implant, as well as those pertaining to the BRYAN® Cervical Disc. However, the causality of these adverse events is not exclusive to these categories. There is also the risk that this surgical procedure will not be effective, and may not relieve or may cause worsening of preoperative symptoms. Some of these effects were observed in the clinical study and therefore have been previously reported in the adverse events tables.

1. Risks associated with any surgical procedure are those such as abscess; cellulitis; wound dehiscence; wound necrosis; edema; hematoma; heart and vascular complications; hypertension; thrombosis; ischemia; embolism; thromboembolism; hemorrhage; thrombophlebitis; adverse reactions to anesthesia; pulmonary complications; gastrointestinal complications; organ, nerve or muscular damage; seizure, convulsion, or changes to mental status; and complications of pregnancy including miscarriage and fetal birth defects.
2. Risks associated with anterior interbody surgery of the cervical spine include dysphagia; dysphasia; dysphonia; hoarseness; vocal cord paralysis; laryngeal palsy; sore throat; recurring aspirations; nerve deficits or damage; tracheal, esophageal, and pharyngeal perforation; airway obstruction; external

chylorrhea; warmth or tingling in the extremities; deficit or damage to the spinal cord, nerve roots, or nerves possibly resulting in paralysis or pain; dural tears or leaking; cerebrospinal fistula; discitis, arachnoiditis, and/or other types of inflammation; loss of disc height; loss of proper curvature, correction, height or reduction of the spine; vertebral slipping; scarring, herniation or degeneration of adjacent discs; surrounding soft tissue damage, spinal stenosis; spondylolysis; otitis media; fistula; vascular damage and/or rupture; and headache.

3. Risks associated with implants in the spine, including the BRYAN® device, are early or late loosening of the components; disassembly; bending or breakage of any or all of the components; implant migration; malpositioning of implant; loss of purchase; sizing issues with components; anatomical or technical difficulties; implant fracture; bone fracture; skin penetration, irritation, pain, bursitis resulting from pressure on the skin from component parts in patients with inadequate tissue coverage over the implant; foreign body reaction to the implants including possible tumor formation, autoimmune disease, metallosis, and/or scarring; possible tissue reaction; bone resorption; bone formation that may reduce spinal motion or result in a fusion, either at the treated level or at adjacent levels; development of new radiculopathy; myelopathy or pain; tissue or nerve damage caused by improper positioning and placement of implants or instruments; loss of neurological function; decreased strength of extremities; decreased reflexes; appearance of cord or nerve root injury; loss of bowel and/or bladder control; and interference with radiographic imaging because of the presence of the implant.
4. Wound, local, and/or systemic infections.
5. Surgical instrument bending or breakage, as well as the possibility of a fragment of a broken instrument remaining in the patient.
6. Inability to resume activities of normal daily living, including loss of consortium.
7. Death.

NOTE: Additional surgery may be necessary to correct some of the adverse effects.

WARNINGS

Correct sizing and placement of the device is essential to optimal performance. The BRYAN® Cervical Disc should only be used by surgeons who are experienced in the surgical procedure and have undergone adequate hands-on training with this specific device. Medtronic will offer hand-on training to physicians prior to the first surgical treatment. A lack of adequate experience and/or training may lead to a higher incidence of adverse events, such as neurological complications.

Due to the proximity of vascular and neurological structures to the implantation site, there are risks of serious or fatal hemorrhage and risks of neurological damage with the use of this device. Serious or fatal hemorrhage may also occur if the major cervical blood vessels are eroded or punctured during implantation and are subsequently damaged due to breakage of implants, migration of implants, or if pulsatile erosion of the vessels occurs because of close apposition of the implants.

PRECAUTIONS

The safety and effectiveness of this device has not been established in patients with the following conditions:

- Axial neck pain as solitary symptom:
- Not skeletally mature;
- Prior cervical spine surgery, including prior surgery at the index level;
- Facet joint pathology of involved vertebral bodies;
- Active malignancy;
- Paget's disease, osteomalacia, or other metabolic bone disease;
- Chronic or acute renal failure or history of renal disease;
- Taking medications known to potentially interfere with bone/soft tissue healing (e.g. steroids);
- Pregnant;
- Unstable cardiac disease:
- Diabetes mellitus requiring daily insulin management; and
- Extreme obesity as defined by the NIH Clinical Guidelines Body Mass Index (i.e., BMI ≥40).

There were no patients in the pivotal study who were less than 21 years of age. The safety and effectiveness of this device has not been studied in the pediatric or adolescent age group (<21 years old).

The safety and effectiveness of this device has not been established in patients who were not refractory to at least six weeks of unsuccessful conservative treatment or had signs of progression or spinal cord/nerve root compression with continued non-operative care.

Implanted metal alloys release metallic ions into the body. The long term effect of these ions on the body is not known.

In order to minimize the risk of periprosthetic vertebral fractures, surgeons must consider all co-morbidities, past and present, medications, previous treatments, etc. Surgeons should screen patients to determine if a DEXA bone mineral density measurement is necessary. If DEXA is performed, the patient should not receive the BRYAN® Cervical Disc (per the contraindications listed above) if the DEXA bone mineral density T-score is ≤-2.5, as the patient may be osteoporotic . It may also be advisable to exclude patients with a T score ≤-1.0, as those patients may be osteopenic.

Patients in the clinical study were instructed to use non-steroidal anti-inflammatory drugs (NSAIDs) for two weeks postoperatively. Dosing and frequency were left to the discretion of the physician. It has been reported in the literature that short-term postoperative use of NSAIDs may reduce the instance of heterotopic ossification.

Correct selection of the appropriate implant size is extremely important to assure the placement and function of the disc. See the surgical technique manual for step-by-step instructions on the surgical technique, including determining the correct implant size.

Patient selection is extremely important. In selecting patients for a total disc replacement, the following factors can be of extreme importance to the success of the procedure: the patient's occupation or activity level; a condition of senility, mental illness, alcoholism or drug abuse; certain degenerative diseases (e.g., degenerative scoliosis or ankylosing spondylitis) that may be so advanced at the time of implantation that the expected useful life of the device is substantially decreased, and medical conditions that may affect postoperative management, such as Alzheimer's disease and emphysema.

Surgical implants must never be re-used or re-implanted. Even though the device appears undamaged, it may have small defects and internal stress patterns that may lead to early breakage.

Use aseptic technique when removing the BRYAN® Cervical Disc device from the innermost packaging.

Use care when handling a BRYAN® disc component to ensure that it does not come in contact with objects that could damage the implant. Damaged implants are no longer functionally reliable.

BRYAN® Cervical Disc components should not be used with components or instruments of spinal systems from other manufacturers. See the surgical technique manual for step-by-step instructions.

Patients should be instructed in postoperative care procedures and should be advised of the importance of adhering to these procedures for successful treatment with the device. Patients should be advised to avoid any activities that require repeated bending, lifting, and twisting, such as athletic activities. Gradual increase in physical activity will depend on individual patient progress.

PHYSICIAN NOTE: Although the physician is the learned intermediary between the company and the patient, the important medical information given in this document should be conveyed to the patient.

USA FOR US AUDIENCES ONLY
CAUTION: FEDERAL LAW (USA) RESTRICTS THESE DEVICES TO SALE BY OR ON THE ORDER OF A PHYSICIAN.

CLINICAL RESULTS

A multi-center, prospective, randomized, non-inferiority clinical trial of the BRYAN® Cervical Disc was conducted in the United States comparing the anterior spinal use of the BRYAN® device to anterior cervical discectomy and fusion (ACDF) using allograft and plating stabilization, the control, for reconstruction of the disc from C3-C7 following single-level discectomy for intractable radiculopathy and/or myelopathy.

A total of 463 patients were treated at 30 investigational centers in the clinical trial: 242 patients in the investigational BRYAN® device treatment group and 221 patients in the control group.

Inclusion and Exclusion Criteria

To qualify for enrollment in the study, subjects met all of the following inclusion criteria and none of the following exclusion criteria.

Inclusion Criteria

- Requires surgical treatment at any one level (C3-4, C4-5, C5-6, or C6-7) that has failed conservative treatment (by the investigator or referring physician) lasting at least six weeks; for any combination of the following: disc herniation with radiculopathy, spondylotic radiculopathy, disc herniation with myelopathy, or spondylotic myelopathy. The six-week conservative treatment period may be waived in cases of myelopathy requiring immediate treatment (e.g., acute onset of clinically significant signs);
- The requirement for surgical treatment must be demonstrated using computed tomography (CT), or myelography and CT, and/or magnetic resonance imaging (MRI);
- Patient must score 30 or more points on the NDI questionnaire and exhibit at least one clinical sign associated with the cervical level to be treated (i.e., abnormal reflex, decreased motor strength, or abnormal dermatome sensitivity);
- Skeletally mature (at least 21 years old);
- Willing and likely to follow the requirements of the protocol; and.
- Voluntarily signs the Patient Informed Consent.

Exclusion Criteria

- Active systemic infection or infection at the operating site
- Metabolic bone disease, such as osteoporosis, which is defined as a bone mineral density T-score equal to or worse than –2.5;
  Note: If the investigator detects the presence of significant radiolucence, bone mineral density (BMD) scan in the spine, wrist, and femoral neck must be obtained to verify the absence of osteoporosis
- Known allergy to titanium, polyurethane, or ethylene oxide residuals;
- Concomitant conditions requiring steroid treatment.
- Diabetes mellitus requiring daily insulin management;
- Extreme obesity, as defined by NIH Clinical Guidelines Body Mass Index;
- Pregnancy;
- Axial neck pain as the solitary symptom;
- Previous cervical spine surgery;
- A medical condition that may interfere with the postoperative management program, such as advanced emphysema, or Alzheimer's disease;
- A medical condition that may result in patient death prior to study completion;
  - Unstable cardiac disease
  - Active malignancy
- Current or recent history of substance abuse (alcoholism and/or narcotic addiction) requiring intervention;
- Signs of being geographically unstable, such as recent or pending divorce, or high level of job dissatisfaction.

Patients with the following radiographic features at the symptomatic level were excluded from the study. These features at adjacent levels did not disqualify the patient from the study.

- Significant cervical anatomical deformity; e.g., ankylosing spondylitis, rheumatoid arthritis, etc.
- Moderate to advanced spondylosis. Patients who demonstrate advanced degenerative changes. Such advanced changes are characterized by any one or combination of the following:
  - Bridging osteophytes
  - Marked reduction or absence of motion
  - Collapse of the intervertebral disc space of greater than 50% of its normal height
- Radiographic signs of subluxation greater than 3.5 mm
- Angulation of the disc space more than 11 degrees greater than adjacent segments; and
- Significant kyphotic deformity or significant reversal of lordosis.

Table 5 summarizes the study patient demographics and baseline characteristics.

Table 5. Study Patient Demographics and Baseline Characteristics.

Variables	Investigational (N=242)	Control (N=221)	p-value
Age (years)	44.4 ± 7.9	44.7 ± 8.6	0.723
Height (inches)	67.6 ± 3.8	67.6 ± 3.8	0.991
Weight (lbs.)	173.3 ± 37.7	180.0 ± 38.9	0.061
BMI	26.6 ± 4.8	27.6 ± 5.0	0.027
Sex (% male)	45.5%	51.1%	0.228
Race			
Caucasian	231	204	0.527
Black	3	5	
Asian	1	2	
Hispanic	3	7	
Other	4	3	
Marital Status			
Single	29	29	0.437
Married	184	169	
Divorced	19	20	
Separated	6	1	
Widowed	4	2	
Education Level			
< High School	16	15	0.743
High School	63	65	
> High School	161	141	
Worker's Compensation	6.2%	5.0%	0.687
Unresolved Spinal Litigation	2.5%	2.7%	1.000
Current Tobacco Use	25.5%	24.0%	0.746
Current Alcohol Use	8.4%	4.1%	0.083
Preoperative Work Status	64.5%	65.0%	0.923
Preoperative NDI Score	51.4 ± 15.3	50.2 ± 15.9	0.392
Duration of Symptoms			
< 6 wks.	10	13	0.180
6 wks. – 3 mos.	36	52	
3 – 6 mos	47	39	
6 mos – 1 yr.	52	37	
1 – 2 yrs.	38	28	
> 2 yrs.	59	52	

In addition to the study patients described above, 117 patients were randomized but declined participation in the study prior to receiving the assigned treatment. Of these patients, 37 would have received the BRYAN disc treatment, while 80 were potential control patients. The demographic and preoperative

characteristics of the patients who declined to participate were comparable to the study patients.

There were 12 patients in this study who were randomized to the investigational treatment but received the control treatment, and one patient who was randomized to the control treatment but received the investigational treatment. Most of these were intraoperative conversions due to sizing issues or difficulty visualizing the target disc space.

Table 6 summarizes the surgical and hospitalization information.

Table 6. Surgical Information.

	Investigational	Control	Probability that the surgical measurements of the investigational group are less than that of the control group (%)
Mean operative time (hrs)	2.2 (n=241)	1.4 (n=221)	0.0
Mean EBL (ml)	91.5 (n=240)	59.6 (n=221)	0.0
Hospitalization (days)	1.1 (n=242)	1.0 (n=221)	4.7
Spinal level treated			
C_{34} (%)	3 (1.2)	0 (0.0)	N/A
C_{45} (%)	12 (5.0)	17 (7.7)	N/A
C_{56} (%)	140 (57.9)	110 (49.8)	N/A
C_{67} (%)	87 (36.0)	94 (42.5)	N/A
BRYAN® Cervical Disc Size Used			
14mm (%)	55 (22.7)	N/A	N/A
15mm (%)	66 (27.3)	N/A	N/A
16mm (%)	57 (23.6)	N/A	N/A
17mm (%)	36 (14.8)	N/A	N/A
18mm (%)	28 (11.6)	N/A	N/A

The recommended post-operative care included avoidance of heavy physical activity and limitations on extended automobile rides, working, lifting, bending and twisting. The recommended post-operative regimen also included avoidance of physically demanding sports or recreational activities for 3 months post-operatively. The decision whether to use a post-operative orthosis was left to the discretion of the investigator. Investigational patients were instructed to use NSAIDs for the first two weeks postoperatively.

Patients were evaluated preoperatively (within 2 months of surgery), intraoperatively, and postoperatively at 6 weeks, 3, 6, 12, and 24 months, and biennially thereafter until the last subject enrolled in the study had been seen for their 24-month evaluation. Complications and adverse events, device-related or not, were evaluated over the course of the clinical trial. At each evaluation timepoint, the primary and secondary clinical and radiographic outcome parameters were evaluated. Success was determined from data collected during the initial 24 months of follow-up.

The safety of the BRYAN® disc was assessed by monitoring intraoperative and postoperative complications. Radiographs were examined for device subsidence, functional spinal unit height maintenance, device migration and breakage. All radiographic endpoints were evaluated independently by a core laboratory and reviewed by independent radiographic reviewers. In addition, some radiographic observations, such as implant malposition, reported by investigators were handled as adverse events.

The clinical study was approved for a total of 470 patients. Medtronic performed a pre-specified interim statistical analysis when approximately 300 implanted subjects had completed their 24-month follow-up visit. At this time all enrolled subjects, i.e. 463 implanted subjects, had reached their 12-month follow-up

window. As predetermined at the time of the IDE study initiation, if the results of this interim analysis demonstrated non-inferiority of the subjects receiving the BRYAN® device compared to controls, the sponsor would submit a marketing application.

The primary endpoint was determined at 24 months as a composite of the following parameters: pain and functional disability, neurological status, adverse events, and secondary surgical interventions. This was termed overall success.

In the approved protocol, individual subject success (i.e. overall success) was defined as attainment of all of the following:

1. An improvement of at least 15 points from the baseline Neck Disability Index (NDI) score;
2. Maintenance or improvement in each evaluated neurological status parameter as compared to the pre-operative baseline score for motor function, sensory function and reflexes;
3. No serious adverse event classified as implant-associated or implant/surgical procedure-associated; and
4. No additional surgical procedure classified as "Failure".

Study success was expressed as the number of individual subjects categorized as a success divided by the total number of subjects evaluated. The table below describes the success rates and Bayesian predictions for individual outcome parameters and overall success. Observed success rates are the 24-month outcomes of the clinical trial. Posterior means can be interpreted as the chance of success at 24 months. When a patient receives the BRYAN device, the chance of overall success as defined in the clinical study at 24 months is 80.4%. Given the results of the trial, there is a 95% probability that the chance of success ranges from 74.3% to 85.8%. When a patient receives the control treatment, the chance of overall success at 24 months is 71.8%. Given the results of the trial, there is a 95% probability that the chance of success ranges from 65.0% to 78.9%.

All success probabilities were for the 24-month outcomes, and posterior probabilities of success were calculated using Bayesian statistical methods. The conclusions were based on the interim analysis which was pre-defined in the protocol. The Bayesian interim analysis, which incorporated both 12- and 24-month data, considered all available data for 12 months and data for the first 300 patients at 24 months.

Table 7. Observed Success Rates at 12 and 24 Months and Posterior Probabilities of Success at 24 Months.

Primary Outcome Variable	12-Month Observed Success Rate		24-Month Observed Success Rate		24-Month Posterior Mean (95% HPD Credible Interval)		24-Month Posterior Probabilities	
	Inv	Ctrl	Inv	Ctrl	Inv	Ctrl	Non-Inferiority	Superiority
NDI	207/234 (88.5%)	153/197 (77.7%)	134/159 (84.3%)	106/140 (75.7%)	85.0% (79.7%, 89.9%)	76.2% (69.7%, 82.6%)	~100%	98.0%
Neurological	220/234 (94.0%)	184/196 (93.9%)	149/159 (93.7%)	128/140 (91.4%)	92.4% (88.4%, 96.1%)	90.9% (86.4%, 95.3%)	~100%	69.2%
Free from Serious, Related Adverse Event Failure*	238/242 (98.4%)	216/221 (97.7%)	158/160 (98.7%)	133/140 (95.0%)	97.6% (95.5%, 99.4%)	95.2% (92.1%, 98.1%)	~100%	89.8%
Free from 2nd Intervention Failure*	239/242 (98.8%)	218/221 (98.6%)	158/160 (98.7%)	135/140 (96.5%)	97.9% (95.9%, 99.5%)	96.1% (93.2%, 98.7%)	~100%	85.1%
Overall Success	198/235 (84.3%)	144/196 (73.5%)	129/160 (80.6%)	99/140 (70.7%)	80.4% (74.3%, 85.8%)	71.8% (65.0%, 78.9%)	~100%	96.9%

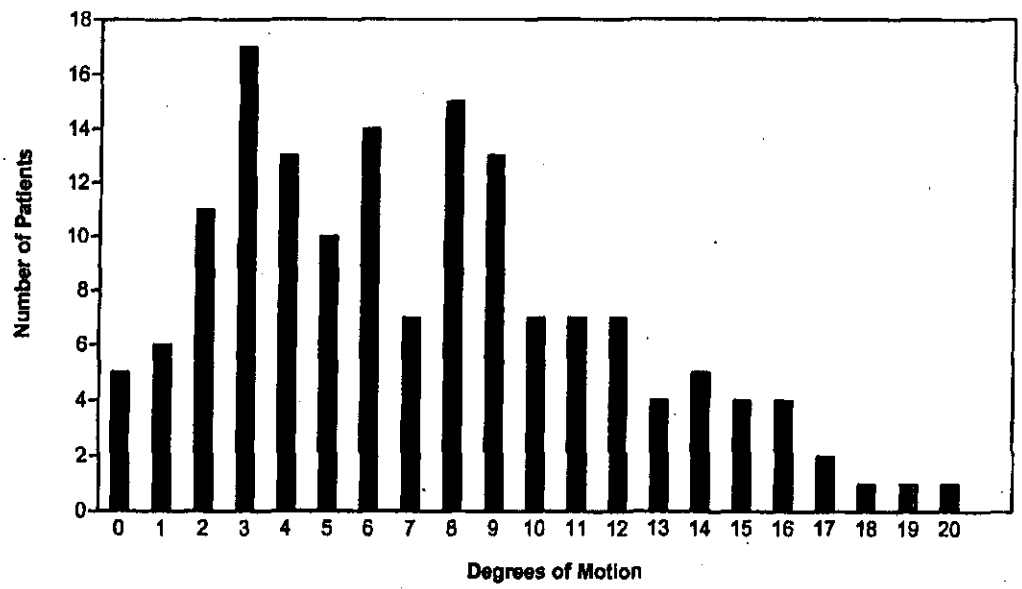
* The denominators for the rates at 12 months are given as the total number of patients due to the cumulative nature of these events. In this table, the clinical evaluation visit dates were used as the back end of the windows, whereas Tables 3 and 4 utilized wider, continuous time windows. Therefore, the events included in this table may appear to differ from those in Tables 3 and 4.

Non-inferiority of the BRYAN® disc group to the control group was demonstrated for NDI, neurological status, and overall success as listed in Table 7 above. Statistical superiority of the BRYAN® disc group to the control group was demonstrated for overall success and the NDI variable for the specifically defined population studied in the clinical trial at 24 months postoperatively. The neurological component was not found to be statistically superior in the BRYAN® group.

The secondary endpoints assessed were Neck Pain, Arm Pain, SF-36 Health Survey, Gait Assessment, Foraminal Compression, Work Status, Patient Satisfaction, Radiographic endpoints, Global Perceived Effect (patient's overall assessment of study treatment effectiveness as a function of pain), and Doctor's Perception (investigator's perception of patient's condition). Radiographic endpoints include FSU height/implant subsidence; anteroposterior implant migration; treated level angular motion in flexion, extension, and side bending; and translational motion. Fusion measurements replaced motion measurements in control patients.

For patients receiving the BRYAN® device, the mean angular range of motion values at 12 and 24 months postoperative, respectively, were 7.77° (n=226) and 7.74° (n=154) as compared to a preoperative value of 6.43° (n=214). Based on the interim analysis cohort, the range of motion values measured from flexion/extension radiographs at 24 months for the BRYAN® device patients are presented in the histogram below. This histogram used values obtained by rounding recorded range of motion for each subject to the nearest integer.

Histogram of BRYAN® Cervical Disc Angular Range of Motion at 24 Months.



An analysis of the correlation between the degree of segmental motion and pain was also performed, and no statistically significant correlations were noted.

To examine the effect of unknown outcomes on study conclusions, sensitivity analyses were conducted by imputing possible overall success outcomes for the missing patients. All analyses, even the worst-case assumptions, demonstrated at least non-inferiority of the BRYAN® Cervical Disc to the fusion control in Overall Success.

PACKAGING

Packages for each of the components should be intact upon receipt. If a loaner or consignment system is used, all sets should be carefully checked for completeness and all components including instruments should be carefully checked to ensure that there is no damage prior to use. Damaged packages or products should not be used, and should be returned to MEDTRONIC.

CLEANING AND DECONTAMINATION

Implants are supplied sterile from Medtronic and should be used directly from the sterile package. Implants should not be cleaned or decontaminated by the user. Unless just removed from an unopened MEDTRONIC package, all instruments must be disassembled (if applicable) and cleaned using neutral or enzymatic cleaners prepared per manufacturer's instructions before sterilization and introduction into a sterile surgical field or (if applicable) return of the product to MEDTRONIC. Cleaning and disinfecting of instruments can be performed with aldehyde-free solvents at higher temperatures. Cleaning and decontamination must include the use of neutral cleaners followed by a deionized water rinse. This should be performed as soon as reasonably practical following use to minimize the potential of drying prior to cleaning.

Instrument Cleaning

When cleaning instruments by hand, the following should be observed:

1. Clear any corners or recesses of all debris (Note: extra care should be taken to clean out any cannulated areas by using an appropriate cleaning stylet and rinsing immediately).
2. Remove all traces of blood and other such residues as soon as reasonably practical following use to minimize the potential of drying.
3. The instruments should be submerged and cleaned with a commercially available manual cleaner (i.e. Terg-A-Zyme from ALCONOX, Inc.) prepared according to the manufacturer's recommendation.
4. Scrub the device, while immersed in the cleaning solution with a soft nylon brush for a minimum of one minute, giving special attention to threads, crevices, and hard to reach areas until visibly clean. During cleaning, actuate device.
5. The instrument should be thoroughly rinsed after cleaning for a minimum of one minute with fresh deionized or tap water. Repeat process if visual inspection warrants repeat cleaning.

Note: certain cleaning solutions such as those containing formalin, glutaraldehyde, bleach and/or other alkaline cleaners may damage some devices, particularly instruments; these solutions should not be used. Also, many instruments require disassembly before cleaning.

All products should be treated with care. Improper use or handling may lead to damage and/or possible improper functioning of the device.

STERILIZATION

Implants are supplied sterile from Medtronic and should be used directly from the sterile package. Unless marked sterile and clearly labeled as such in an unopened sterile package provided by the company, instruments used in surgery must be sterilized by the hospital prior to use. Remove all packaging materials prior to sterilization. Only sterile products should be placed in the operative field. Unless specified elsewhere, these products are recommended to be steam sterilized by the hospital using the process parameters below:

METHOD	CYCLE	TEMPERATURE	EXPOSURE TIME	DRY TIME
Steam	Pre-Vacuum	270°F (132°C)	4 Minutes	30 Minutes

NOTE: Because of the many variables involved in sterilization, each medical facility should calibrate and verify the sterilization process (e.g. temperatures, times) used for their equipment. It is the responsibility of the end user to ensure that the available equipment (sterilizer and accessories including appropriate sterilization indicators and wraps, as applicable) is compatible with the set of parameters listed above.

Remove all packaging material prior to sterilization. Only sterile implants and instruments should be used in surgery. No implant should be re-used once it comes into contact with human tissue or body fluid. Always immediately clean and re-sterilize instruments that have been used in surgery. This process must be performed before handling or (if applicable) returning to MEDTRONIC.

PRODUCT COMPLAINTS

Any Health Care Professional (e.g., customer or user of this system of products), who has any complaints or who has experienced any dissatisfaction in the product quality, identity, durability, reliability, safety, effectiveness and/or performance, should notify the distributor or MEDTRONIC. Further, if any of the implanted spinal system component(s) ever "malfunctions," (i.e., does not meet any of its performance specifications or otherwise does not perform as intended), or is suspected of doing so, the distributor should be notified immediately. If any MEDTRONIC product ever "malfunctions" and may have caused or contributed to the death or serious injury of a patient, the distributor should be notified immediately by telephone, fax or written correspondence. When filing a complaint, please provide the component(s) name and number, lot number(s), your name and address, the nature of the complaint and notification of whether a written report from the distributor is requested.

FURTHER INFORMATION

Recommended directions for use of this system (surgical operative techniques) are available at no charge upon request. If further information is needed or required, please contact MEDTRONIC at 1-800-876-3133.

DEVICE RETRIEVAL EFFORTS

Should it be necessary to remove a BRYAN® Cervical Disc device, please call MEDTRONIC prior to the scheduled surgery for product/tissue retrieval information. Please refer to the BRYAN® Cervical Disc Surgical Technique for step-by-step instructions on the required technique for device retrieval and instructions for returning the explanted device to MEDTRONIC. All explanted devices must be returned to MEDTRONIC for analysis.

BRYAN® Cervical Disc
Patient Education Brochure
(Draft)
(Figures included at end of this document. Final version will include layout as well.)

Text on inside cover page

This patient information brochure is designed to help you understand one treatment option for your neck pain and related problems. After reviewing your medical history, x-rays, and the results of other tests you have completed, your doctor has recommended you consider surgery to relieve your pain and discomfort. This patient brochure explains one option, surgery using the BRYAN® Cervical Disc. The purpose of this brochure is to give you background about cervical spine (neck) surgery and the BRYAN® Cervical Disc. Please read this brochure entirely before your cervical surgery.

Glossary

Disc Herniation - pushing out of the inner part of the intervertebral disc through a hole in the outer layer of the intervertebral disc

Foramen - an opening where spinal nerves pass through

Heterotopic Ossification – bone formation around or across the intervertebral disc space

Intervertebral Disc – connecting soft material between the vertebrae that provides cushioning and movement of the spine

Myelopathy – disease in the spinal cord

Radiculopathy – disease of the nerve roots in or near the spine as a result of pressure from an intervertebral disc, or irritation of the nerve roots due to disc or spinal joint disease

Spondylosis – bone formation on the soft material that connects the bones of the spine

What is the cervical spine?

The spinal column bones (vertebrae), which encircle and protect your spinal cord, are separated by shock-absorbing discs. These discs give your spine the flexibility to move. Nerves branching from the spinal cord pass through openings in the vertebrae to other parts of your body. The spine can be divided into four regions: cervical (neck), thoracic (middle back), lumbar (lower back), and the sacrum (tail bone) (Figure 1).

The cervical region of the spine is made up of seven vertebrae, C1-C7. The BRYAN® Cervical Disc is intended to treat the disc spaces between the C3 and C7 vertebral bodies (Figure 2).

What is disc degeneration?

As discs lose their water content because of disease or age, they lose their height and bring the vertebrae closer together. The consequence is a weakening of the shock absorption properties of the disc and narrowing of the openings for the nerves in the sides of the spine. Additionally, a loss of disc height may cause the formation of bone spurs, which can push against your spinal cord and/or nerves causing a condition called spinal cord and/or nerve root compression (Figure 3). This condition can also occur when a disc ruptures in the cervical spine, putting pressure on the spinal cord and/or nerve roots resulting in pain and other symptoms such as weakness or tingling in the neck and arms. Living with these symptoms can be disabling.

Why do I need surgery?

With the advice of your doctor, you have tried to relieve your symptoms with other treatments such as physical therapy and medications for at least six weeks, but these treatments have not relieved your pain or dysfunction. Your doctor has recommended that you may get relief of your symptoms by having surgery. One type of surgery is total disc replacement, and the BRYAN® Cervical Disc is one total disc replacement option.

What is the BRYAN® Cervical Disc?

The BRYAN® Cervical Disc is made of two metal (titanium) shells, and a plastic (polyurethane) central core. It is designed to provide motion by allowing movement between the metal components and the plastic component. It is inserted into the affected disc space of your neck. The device is designed to help relieve pain. It is intended to be used in patients with only one diseased disc requiring surgery in their neck (Figure 4).

Who Should Receive the BRYAN® Cervical Disc?

If you are an adult with good bone quality who has undergone at least six weeks of conservative (non-surgical) treatment, and if you are still experiencing symptoms related to reduced function of the upper extremities such as arm weakness, poor reflexes, and/or decreased nerve sensation along with any combination of the following conditions, you may be selected to receive the BRYAN® Cervical Disc:

- arm pain and/or tingling as a result of a disc herniation (radiculopathy),
- arm pain and/or tingling as a result of bony spurs (spondylotic radiculopathy),
- neck pain and/or trouble walking as a result of a disc herniation (myelopathy),
- neck pain and/or trouble walking as a result of bony spurs (spondylotic myelopathy).

In addition to experiencing one or more of the symptoms described above, your surgeon should confirm the need for surgery by using diagnostic imaging such as computed tomography (CT), myelography and CT, and or magnetic resonance imaging (MRI). The BRYAN® Cervical Disc is implanted via an open (through an incision) anterior (from the front) approach.

Who should avoid having cervical disc surgery? (Contraindications)

If you are experiencing any of the following conditions, you should avoid having cervical disc surgery:

- active systemic (whole body) infection or infection at the operating site;
- allergy to titanium (metal part of device), polyurethane (plastic part of device), or ethylene oxide residues (used in making the device sterile);
- osteoporosis (loss of calcium from bone resulting in bones that break easily);
- moderate to advanced spinal arthritis (spondylosis);
- unstable cervical spine as seen on X-ray;
- diseased disc has much more movement than adjoining discs;
- deformed cervical spine or spinal column bones that are not healthy;
- significant loss of the normal curvature of your neck (lordosis);
- significant change in the curve of your neck (kyphosis); or
- more than one cervical disc that needs treatment.

What warnings and precautions should I pay attention to?

In the U.S. clinical trial, the BRYAN® Cervical Disc was used only in patients who met certain requirements. Examples of these requirements are that patients in the study could not have diabetes that needs to be treated with daily insulin therapy, they could not be pregnant, and they could not be taking certain medications such as steroids. Therefore, it is not known if the BRYAN® Device will perform as well in other types of patients as it did in patients who were studied in the U.S. clinical trial.

Heterotopic ossification (HO) is a complication associated with cervical total disc replacements (including among others, the BRYAN® Cervical Disc), and it has been reported in some studies outside of the United States. One of the consequences of HO can be reduced motion. It has also been reported in the literature that short-term postoperative use of non-steroidal anti-inflammatory drugs (NSAIDS), such as ibuprofen, may reduce the instance of HO. Patients in the BRYAN® Cervical Disc U.S. clinical study were instructed to use NSAIDS for two weeks postoperatively.

This device is placed close to nerves and important blood vessels and arteries in the cervical spine. There is a risk of nerve damage and/or serious or fatal bleeding if damage to these structures occurs during or after surgery.

It is important that you let your doctor know about any allergies you have, any medications you take on a regular basis, if you are pregnant, or if you have any other treated or untreated illnesses that may help your doctor decide if this device is right for you.

You should discuss both surgical and nonsurgical treatment options with your doctor. If surgery is selected, your occupation, activity level, weight, your overall health, and the condition of your spine will help to determine if you are an appropriate candidate for surgery with the BRYAN® Cervical Disc. Only your doctor can decide if you are an appropriate candidate.

This device should be used only by surgeons who are experienced in this procedure and have undergone hands-on training with this specific device. A lack of adequate experience and/or training may lead to less successful outcomes or more complications.

What are the risks and adverse effects with this type of surgery?

Like any surgery, there are some possible complications that may occur when you receive the BRYAN® Cervical Disc. Possible complications that may occur singly or in combination include:

- Allergic reaction to the implant material
- Implant loosening or failure
- Infection of your wound, at the operative site, and/or systemic infection
- Painful or difficult swallowing
- Impairment of or change in speech
- Trauma during surgery such as nerve or spinal cord injury, excessive bleeding and/or vertebral body (spinal bone) fractures
- Nerve damage
- Implant components bending, breaking, loosening, or moving
- Instruments bending or breaking
- Neck and/or arm pain
- Change in the curvature of your neck
- Nerve or spinal cord injury, possibly causing impairment or paralysis
- Numbness, tingling, or muscle weakness in your extremities
- Tear in the protective membrane (dura) covering the spinal cord
- Loss of motion (unintended fusion) at the treated level
- Development or progression of disease at other levels in your cervical spine
- Bleeding or collection of clotted blood (hematoma)
- Blood clots and blood flow restrictions, possibly resulting in stroke
- Swelling
- Reactions to anesthesia used during your surgery
- Changes in mental status
- Complications of pregnancy, including miscarriage and fetal birth defects
- Inability to resume activities of normal daily living, including sexual activity
- Death

There is also a risk that this surgical procedure may not make you feel better or may cause you to feel worse. If this happens you may need another surgery to help you feel better.

Not all of the adverse events listed above occurred in the U.S. clinical study, For the 242 patients who received the BRYAN® Cervical Disc in the clinical study, some of the most common events were neck and/or arm pain, difficulty swallowing, impairment of speech, and infection. Six patients had additional neck surgery after their disc replacement. There may be other risks associated with treatment using the BRYAN® Cervical Disc. Although many of the major risks are listed in this patient information brochure, a more comprehensive list is provided in the physician's package insert for the product, which your doctor has received. Please ask your doctor for more information about any additional risks possibly related to your planned surgery.
Note: Additional surgery may be necessary to correct some of the adverse effects.

What are the expected outcomes of the surgery?

In the U.S. clinical trial comparing the BRYAN® Cervical Disc to fusion, many different outcomes were measured. The outcomes were similar in both groups; however two outcome measures were calculated to be statistically higher in the group receiving the BRYAN®. The clinical importance of the differences in these outcome measures is not yet known. The rates of complications were about the same between the two groups in the first two years following surgery. The clinical benefit beyond two years has not been measured. Ask your doctor for more details about the clinical study and your expected results.

How is the BRYAN® Cervical Disc procedure different from anterior cervical discectomy and fusion?

The BRYAN® Cervical Disc is an alternative to anterior cervical discectomy and fusion (ACDF). In the ACDF procedure, after the disc is removed, the bones are fixed in position with the hope that they will eventually grow together creating one solid piece of bone. Fusion, which is the surgery that is most commonly done for your condition, is designed to treat your symptoms by eliminating the motion at the treated level (Figure 5). In both the ACDF and the BRYAN® Cervical Disc procedures, the unhealthy disc is removed. In the BRYAN® Cervical Disc procedure, the device is inserted into the disc space after the disc is removed. The BRYAN® device is designed to allow motion at the treated level.

How do I prepare for surgery?

Items your doctor may cover with you:

- See your general practitioner before surgery to check your overall health.
- Tell your doctor what medicines you are taking and ask if you should stop taking any of these medicines before surgery.

- Your doctor will review your condition with you and explain what all of your possible choices are including medications, physical therapy, and other surgeries such as removal of the diseased disc, fusion, etc.
- Be careful not to eat or drink the night before the surgery
- Prepare your home for life after surgery - place important things within easy reach.
- Remove safety hazards that might cause you to lose your balance.
- Arrange for someone to help you at home and around the house after surgery.
- Be sure you read and understand this entire brochure.
- Ask your surgeon to tell you of the risks, as well as benefits, of this surgery.

What is involved in a BRYAN® Cervical Disc procedure?

This surgery involves the use of a medical device, designed to replace the disc which sits between the vertebrae in your neck. During surgery, you will be under general anesthesia. Your disc, which is damaged or diseased, is surgically removed through an incision (cut) made in the front of your neck. Typically, this incision is about an inch long. Your surgeon will prepare a space and insert a BRYAN® Cervical Disc into the disc space (Figure 6).

What can I expect after surgery?

Ask your doctor about your specific recovery plan following surgery. It is important to follow your doctor's instructions carefully to recover from surgery as quickly as possible and to increase your chances of a successful outcome. Surgery with the BRYAN® Cervical Disc is considered major surgery. You can expect to stay in the hospital approximately one day. As with any major surgery, you should expect some discomfort and a period of rehabilitation. Recovering from neck pain and surgery is an ongoing process. How fast you recover depends on the type of surgery you had, your commitment to working closely with your physical therapist, and moving and exercising correctly, as recommended by your doctor.

A nurse or doctor will:

- show you how to care for your wound before you are sent home
- show you how to take care of a drainage tube in your wound, if that is part of your therapy
- discuss a program to gradually increase your activity
- require, perhaps, you to wear a neck brace after surgery
- advise you to avoid any activities that require repeated bending, lifting, twisting, such as athletic activities
- schedule office visits to check on how you are doing and to see if anything else needs to be done for your recovery
- prescribe medicines to control pain and nausea.

Contact your doctor immediately if:

- you get a fever

- the wound starts leaking fluids
- you have trouble swallowing or breathing
- you have trouble urinating
- you have new or increased neck or arm pain, numbness, or weakness.

After surgery, your doctor may refer you to a physical therapist who will teach you exercises to improve your strength and increase your mobility. The goal of physical therapy is to help you become active as soon as possible, using safe body movements that protect your spine. This often includes neck strengthening exercises. You may also be taught different ways of positioning your neck to avoid reinjuring your spine.

Can I shower after surgery?

You will have a bandage on your neck. You may shower quickly but try not to soak the dressing. Do not use a hot tub.

Will I have a scar?

The incision is usually less than one inch long and usually heals so that it is barely noticeable.

When can I drive?

For a period of time after your surgery, you may be cautioned about activities such as driving. Your doctor will tell you when you may drive again.

Can I travel?

Because of increased airport security measures, please call your local airport authority before traveling to get information that might help you pass through security more quickly and easily. Ask your surgeon to provide a patient identification card.

What if I have more questions?

While this brochure is meant to provide you with information you need to make an informed decision about your treatment options, it is not intended to replace professional medical care or provide medical advice.

If you have any questions about the BRYAN® Cervical Disc, please call or see your doctor, who is the only one qualified to diagnose and treat your spinal condition. As with any surgical procedure, you should find a doctor who is experienced in performing the specific surgery that your are considering.

How can I contact someone at the manufacturer?

Medtronic Spinal and Biologics
2600 Sofamor Danek Drive
Memphis, Tennessee 38132
Toll Free Number: 1-800-876-3133

For additional information visit:

www.necksurgery.com

www.bryandisc.com

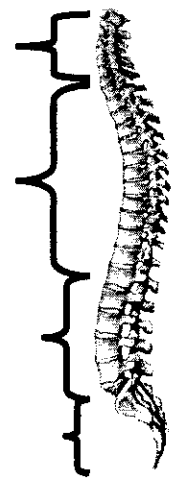
LIST OF ILLUSTRATIONS

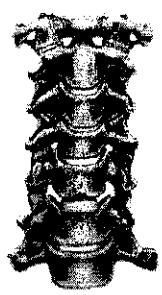
Neck (cervical)

Middle (thoracic)

Lower (lumbar)

Tailbone (sacrum)





BRYAN ACDI-08b.jpg

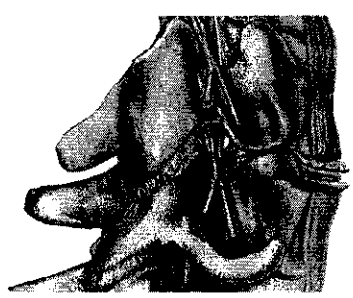


Figure 4 Image of the BRYAN implant itself

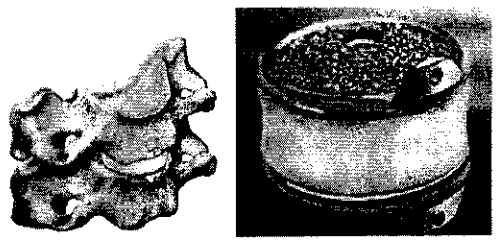


Figure 5 Image of c-spine with plate used in fusion

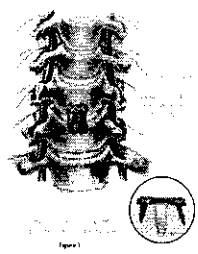


Figure 6 Image of C-spine with Bryan disc