Post market study to evaluate safety and effectiveness of the InnFocus MicroShunt® (MIDI Arrow) in patients with primary open angle glaucoma

Published: 27-03-2015
Last updated: 22-04-2024

The purpose of this study is to collect additional safety and effectiveness of the InnFocus MicroShunt (MIDI Arrow) in subjects suffering from primary open angle glaucoma that are inadequately controlled on maximum tolerated medical therapy with...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Glaucoma and ocular hypertension
Study type	Interventional

Summary

ID

NL-OMON42294

Source
ToetsingOnline

Brief title
Innfocus MicroShunt® (MIDI Arrow) Study

Condition

- Glaucoma and ocular hypertension

Synonym
Primary open-angle glaucoma

Research involving
Human

Sponsors and support

Primary sponsor: Innfocus Inc.

Source(s) of monetary or material Support: Innfocus Inc.;Miami;USA

Intervention

Keyword: InnFocus MicroShunt® (MIDI Arrow), Post-market, Primary open angle glaucoma, Safety and Effectiveness

Outcome measures

Primary outcome

Primary effectiveness endpoint:

* Reduction in intraocular pressure relative to the pre-operative value will be assessed at each post-operative visit (D1, D7, W4, M3, M6, M9, M12 and M24) with a first measurement of success at 12 months.

* For patients with baseline IOP *18 to * 21 mmHg, success will be measured as a patient who achieves an IOP reduction of 20% or greater with no reoperation for glaucoma or loss of light perception vision.

* For patients with baseline IOP >21 mmHg, success will be measured as a patient with IOP<21 mmHg and IOP reduction from baseline of 20% or greater with no reoperation for glaucoma or loss of light perception vision.

* Complete success is a patient who is not on supplemental medical therapy to obtain controlled levels of intraocular pressure.

* Qualified success is defined as a patient who requires supplemental medical therapy to maintain controlled levels of intraocular pressure.

A reoperation to better the aqueous drainage like a trabeculectomy or an implantation of another drainage implant is considered a failure as it does not fulfill the criteria for success mentioned above. Needling of the bleb or post-surgical injection of an anti-fibrotic are not considered failures.

Primary safety endpoint :

Incidence of all device and/or procedure-related Adverse Events during the

study.

Secondary outcome

Secondary effectiveness endpoint:

New measurement of success at 24 months.

Level of glaucoma supplemental medical therapy at M12 and M24.

Secondary safety endpoints:

Incidence of all Adverse Events reported during the study.

Study description

Background summary

The InnFocus, Inc. InnFocus MicroShunt glaucoma drainage device has undergone extensive pre-clinical and clinical testing and a CE Mark was granted in January 25, 2012. As part of the continuing efforts to evaluate performance and safety, a market surveillance program is being initiated at several institutions in Europe. This will result in the device being used by numerous surgeons and will provide an expanded understanding of ease of implantation, surgical success of the device, and relative success in a larger cross-section of patients who have glaucoma.

Prior clinical studies and regulatory status:
The one year results of clinical studies have demonstrated IOP reduction that is comparable or better than trabeculectomy or competitive glaucoma drainage devices. A discussion of the complications is contained in the risks section that follows and supports that the risks are comparable or better than trabeculectomy and competitive glaucoma drainage devices.

Histology:
Histology conducted on InnFocus MicroShunt explanted from the eyes of rabbits has shown excellent healing without the presence of myofibroblasts.

Benefits:
The InnFocus MicroShunt is intended to decrease the intraocular pressure in the eye caused by glaucoma to a normal level that aids in managing the long term effects of the disease. In the majority of cases, the normal pressure range is from 6 mmHg to 21 mmHg, although there are cases in which the disease can be detrimental with pressures in the normal range. At the same time, the InnFocus MicroShunt has been designed to minimize the most common and feared immediate postoperative complication; hypotony. Low IOP is associated with shallow and flat anterior chambers, choroidal effusions and detachment, and corneal decompensation that jeopardize vision. The new glaucoma drainage implant was designed with a small lumen diameter of approximately 70 *m to avoid the excessive postoperative outflow that may occur with current drainage devices in the immediate postoperative period. The use of a tube with a 70 *m lumen was calculated from the well-known Hagen-Poiseulle equation which relates flow rate into the eye, and therefore out of the eye, with pressure, diameter and length of the outflow tube (the GDI), and adjusted based on experience in animal studies. It is noteworthy to mention that current drainage devices made with a silicone tube and a connecting reservoir, have approximately 300 *m of lumen diameter.

Risks:
a. The cornea or iris could be damaged during the implantation procedure or post implantation. Based on prior clinical data, no cornea or iris damage has been observed although occasionally the device has made direct contact with the iris. Additionally, surgeons are instructed on the proper insertion method. This potential contact risk with the iris or cornea is similar to presently commercialized aqueous shunts (Ahmed, Baerveldt, Molteno) as they require placement of the proximal end of the tube in the same location as the InnFocus MicroShunt.
b. The device may not be inserted completely into the anterior chamber. If this occurs, the device may be relocated to a different access tract or another device may be implanted. In either case, this would result in an overall longer procedure. There has only been one case with the present device in which a second insertion location adjacent to the original location was required with the same device with a corresponding longer procedure time. No other complications were observed.
c. The device could clog if it remains in contact with the iris with resultant low flow and increased IOP. Although contact with the iris has been observed with the present device, flow has been maintained. If the tip does become clogged, the physician can use a standard laser to remove the iris material from the tip of the device. This risk is also present with the proximal end of aqueous shunts which can contact the iris or cornea and lasers are routinely used to clear debris from the proximal end.
d. The bleb that is typically created by the aqueous flow into the Tenon/sub-conjunctival pocket may develop excessive scarring (bleb encapsulation or also called *Tenon*s cyst*) which can result in lower aqueous flow through the bleb and increased IOP. The implantation procedure has been

refined to provide for a large pocket that is resistant to fibrosis and scarring. One bleb encapsulation was observed in prior InnFocus MicroShunt studies and was successfully needled. A similar risk of scarring is observed with trabeculectomy. e. Choroidal effusion may occur and lead to an observable choroidal detachment. This has been observed in 2 prior InnFocus MicroShunt cases during combined surgery with cataract removal and resolved with the use of cycloplegics. There was no incidence of suprachoroidal hemorrhage in studies to date but this should be considered a risk of this surgery, as it is with trabeculectomy.
f. Flat or shallow chambers may occur as the result of low pressure in the anterior chamber. Two cases of shallow chambers were observed in studies to date and resolved spontaneously with no observable damage to the cornea or iris.
g. Wound leaks may occur shortly after surgery and may be related to the suturing of the conjunctiva to the limbus. One short term wound leak was observed but resolved spontaneously within the first three weeks after surgery. No long term wound leaks have been observed in existing studies of this device.
h. No blebitis has been observed in clinical studies to date but is a risk whenever a bleb is developed as a result of the surgery.
i. No endophthalmitis has been observed but it is a risk of this type of surgery, especially in the event that blebitis develops.
j. Hyphema has been observed in several cases but not at a level of 10% or more of the anterior chamber and typically resolves within one week of surgery.
k. Aqueous misdirection is a potential risk of filtering surgery but has not been observed in existing studies of the device.
l. Decompression retinopathy has not been observed but remains a risk with this type of surgery.
m. Persistent hypotony is defined as an intraocular pressure below 6mm that is present on two consecutive follow-ups after three months. This can lead to hypotony maculopathy. No persistent hypotony or hypotony maculopathy have been observed in studies to date.
n. Corneal decompensation from MMC exposure could occur if MMC reached the corneal endothelium as has been reported in an animal model in the literature and is another risk. Avoiding contact of MMC with the cornea endothelium by rinsing MMC out of the subconjunctival pocket prior to entry of the needle into the AC should assure no entry of MMC and therefore no effect on the endothelium. Corneal decompensation has not been observed in InnFocus MicroShunt clinical studies to date.
o. A thin-walled avascular bleb may be associated with low IOP. This has not been observed in the prior InnFocus MicroShunt studies.
p. Tube erosion over time resulting in a break in the conjunctival barrier and potential infection is a risk in the InnFocus MicroShunt arm of the study. There have been no tube erosions in the ongoing studies of the InnFocus MicroShunt.
q. Chronic or recurrent iritis is a risk associated with filtering surgery. No chronic or recurrent iritis has been observed in the ongoing InnFocus MicroShunt clinical studies.
r. Tube obstruction is a risk with the InnFocus MicroShunt procedure. There has

been one transient tube obstruction from fibrin in a combined InnFocus MicroShunt implantation and cataract surgery in an ongoing study that was resolved with a flush of the AC end of the tube during the initial surgery. Viscoelastics have not been tested with this device. However, in an emergency when all other therapies have failed, the use of hydroxyl methyl-cellulose (HPMC) may be an option. Use of HPMC should be a last resort to correct a flat chamber with the InnFocus MicroShunt and may risk loss of flow through the device for one or more weeks after use necessitating close or more frequent observation of IOP. There have been no cases of the need to use viscoelastics to correct flat chamber to date.
s. Migration of device out of anterior chamber. There have been no cases of InnFocus MicroShunt migration out of the anterior chamber, but there has been one case where the surgeon inadvertently moved the InnFocus MicroShunt out of the anterior chamber during conjunctival closure at time of the original procedure.

Risk/Benefit Summary:
The overall benefit of the InnFocus MicroShunt Glaucoma Implant outweighs its residual risks. Efficacy results compare well with trabeculectomy and competitive glaucoma drainage devices, while complications are equivalent or better. As compared to alternatives, the procedure itself is easier and the procedure time is less.

Study objective

The purpose of this study is to collect additional safety and effectiveness of the InnFocus MicroShunt (MIDI Arrow) in subjects suffering from primary open angle glaucoma that are inadequately controlled on maximum tolerated medical therapy with intraocular pressure * 18 mm Hg and * 35 mm Hg and/or.where glaucoma progression warrants surgery.

Study design

This is a prospective, multicentric, single arm post-market study with a CE marked device conducted at up to 4 European locations in which each patient meeting the inclusion criteria and not excluded per the exclusion criteria will be implanted with a InnFocus MicroShunt in the anterior chamber of the eye. Patients will be followed for 24 months with an expected enrollment period of up to 12 months. Safety of the InnFocus MicroShunt will be confirmed with indirect and direct microscopic evaluation of the implanted and non-implanted eyes pre and post operatively, and at defined follow-up intervals for hypotony, inflammation, infection, migration of the shunt, visual acuity, as well as a number of other defined potential complications. The effectiveness of the shunt will be evaluated by measurement of intraocular pressure at defined intervals.

Intervention

Each potential patient will be seen by the investigator during a first visit and will be given an informed consent to be signed. Then each patient who will agree to participate (considered as enrolled at that time)will undergo a qualifying assessment to determine their eligibility for the study. If the patient meets all of the inclusion criteria and none of the exclusion criteria, he will qualify for surgery (non standard surgery).

The type of anaesthesia will be at the surgeon*s discretion. The procedure will be performed under standard local anaesthesia. It is expected that the InnFocus MicroShunt implantation procedure will take a few hours only to complete. After the procedure, the patient will be provided with eye drops/ointment for use when he/she returns home.

The patient will need to return for examinations the first day after the procedure, then at 1 week after and then at 1, 3, 6, 9, 12 and 24 months after surgery. The number and frequency of those follow-up visits would also be scheduled for other classic glaucoma surgery procedures. Additionally, the investigator may require the patient be seen for unscheduled visits (if needed). At the follow-up examinations, most of the same testing (standard eye testing) that was performed before the surgery procedure is repeated. The same eye testing is also indicated for other glaucoma surgery procedures.

Study burden and risks

Benefits:
The InnFocus MicroShunt is intended to decrease the intraocular pressure in the eye caused by glaucoma to a normal level that aids in managing the long term effects of the disease. In the majority of cases, the normal pressure range is from 6 mmHg to 21 mmHg, although there are cases in which the disease can be detrimental with pressures in the normal range. At the same time, the InnFocus MicroShunt has been designed to minimize the most common and feared immediate postoperative complication; hypotony. Low IOP is associated with shallow and flat anterior chambers, choroidal effusions and detachment, and corneal decompensation that jeopardize vision. The new glaucoma drainage implant was designed with a small lumen diameter of approximately 70 *m to avoid the excessive postoperative outflow that may occur with current drainage devices in the immediate postoperative period. The use of a tube with a 70 *m lumen was calculated from the well-known Hagen-Poiseulle equation which relates flow rate into the eye, and therefore out of the eye, with pressure, diameter and length of the outflow tube (the GDI), and adjusted based on experience in animal studies. It is noteworthy to mention that current drainage devices made with a silicone tube and a connecting reservoir, have approximately 300 *m of lumen diameter.

Risks:
a. The cornea or iris could be damaged during the implantation procedure or post implantation. Based on prior clinical data, no cornea or iris damage has

been observed although occasionally the device has made direct contact with the iris. Additionally, surgeons are instructed on the proper insertion method. This potential contact risk with the iris or cornea is similar to presently commercialized aqueous shunts (Ahmed, Baerveldt, Molteno) as they require placement of the proximal end of the tube in the same location as the InnFocus MicroShunt.

b. The device may not be inserted completely into the anterior chamber. If this occurs, the device may be relocated to a different access tract or another device may be implanted. In either case, this would result in an overall longer procedure. There has only been one case with the present device in which a second insertion location adjacent to the original location was required with the same device with a corresponding longer procedure time. No other complications were observed.

c. The device could clog if it remains in contact with the iris with resultant low flow and increased IOP. Although contact with the iris has been observed with the present device, flow has been maintained. If the tip does become clogged, the physician can use a standard laser to remove the iris material from the tip of the device. This risk is also present with the proximal end of aqueous shunts which can contact the iris or cornea and lasers are routinely used to clear debris from the proximal end.

d. The bleb that is typically created by the aqueous flow into the Tenon/sub-conjunctival pocket may develop excessive scarring (bleb encapsulation or also called *Tenon*s cyst*) which can result in lower aqueous flow through the bleb and increased IOP. The implantation procedure has been refined to provide for a large pocket that is resistant to fibrosis and scarring. One bleb encapsulation was observed in prior InnFocus MicroShunt studies and was successfully needled. A similar risk of scarring is observed with trabeculectomy.

e. Choroidal effusion may occur and lead to an observable choroidal detachment. This has been observed in 2 prior InnFocus MicroShunt cases during combined surgery with cataract removal and resolved with the use of cycloplegics. There was no incidence of suprachoroidal hemorrhage in studies to date but this should be considered a risk of this surgery, as it is with trabeculectomy.

f. Flat or shallow chambers may occur as the result of low pressure in the anterior chamber. Two cases of shallow chambers were observed in studies to date and resolved spontaneously with no observable damage to the cornea or iris.

g. Wound leaks may occur shortly after surgery and may be related to the suturing of the conjunctiva to the limbus. One short term wound leak was observed but resolved spontaneously within the first three weeks after surgery. No long term wound leaks have been observed in existing studies of

this device.

h. No blebitis has been observed in clinical studies to date but is a risk whenever a bleb is developed as a result of the surgery.

i. No endophthalmitis has been observed but it is a risk of this type of surgery, especially in the event that blebitis develops.

j. Hyphema has been observed in several cases but not at a level of 10% or more of the anterior chamber and typically resolves within one week of surgery.

k. Aqueous misdirection is a potential risk of filtering surgery but has not been observed in existing studies of the device.

l. Decompression retinopathy has not been observed but remains a risk with this type of surgery.

m. Persistent hypotony is defined as an intraocular pressure below 6mm that is present on two consecutive follow-ups after three months. This can lead to hypotony maculopathy. No persistent hypotony or hypotony maculopathy have been observed in studies to date.

n. Corneal decompensation from MMC exposure could occur if MMC reached the corneal endothelium as has been reported in an animal model in the literature and is another risk. Avoiding contact of MMC with the cornea endothelium by rinsing MMC out of the subconjunctival pocket prior to entry of the needle into the AC should assure no entry of MMC and therefore no effect on the endothelium. Corneal decompensation has not been observed in InnFocus MicroShunt clinical studies to date.

o. A thin-walled avascular bleb may be associated with low IOP. This has not been observed in the prior InnFocus MicroShunt studies.

p. Tube erosion over time resulting in a break in the conjunctival barrier and potential infection is a risk in the InnFocus MicroShunt arm of the study. There have been no tube erosions in the ongoing studies of the InnFocus MicroShunt.

q. Chronic or recurrent iritis is a risk associated with filtering surgery. No chronic or recurrent iritis has been observed in the ongoing InnFocus MicroShunt clinical studies.

r. Tube obstruction is a risk with the InnFocus MicroShunt procedure. There has been one transient tube obstruction from fibrin in a combined InnFocus MicroShunt implantation and cataract surgery in an ongoing study that was resolved with a flush of the AC end of the tube during the initial surgery. Viscoelastics have not been tested with this device. However, in an emergency

when all other therapies have failed, the use of hydroxyl methyl-cellulose (HPMC) may be an option. Use of HPMC should be a last resort to correct a flat chamber with the InnFocus MicroShunt and may risk loss of flow through the device for one or more weeks after use necessitating close or more frequent observation of IOP. There have been no cases of the need to use viscoelastics to correct flat chamber to date.

s. Migration of device out of anterior chamber. There have been no cases of InnFocus MicroShunt migration out of the anterior chamber, but there has been one case where the surgeon inadvertently moved the InnFocus MicroShunt out of the anterior chamber during conjunctival closure at time of the original procedure.

Risk/Benefit Summary:
The overall benefit of the InnFocus MicroShunt Glaucoma Implant outweighs its residual risks. Efficacy results compare well with trabeculectomy and competitive glaucoma drainage devices, while complications are equivalent or better. As compared to alternatives, the procedure itself is easier and the procedure time is less.

Contacts

Public
Innfocus Inc.

SW 136 Avenue - Unit 3 12415
Miami FL331869
US
Scientific
Innfocus Inc.

SW 136 Avenue - Unit 3 12415
Miami FL331869
US

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

1) Male or female, age 18 to 85 years, inclusive.
2) Subject has mild to moderate primary open glaucoma where the IOP is not adequately controlled on maximum tolerated medical therapy and has intraocular pressure greater than or equal to 18mmHg and less than or equal to 35mmHg while on glaucoma medications and/or.where glaucoma progression warrants surgery..
3) Primary open angle glaucoma diagnosis based on:
a. glaucomatous optic nerve damage as evidenced by any of the following optic disc or retinal nerve fiber layer structural abnormalities documented on slit lamp stereo biomicroscopy or in stereo disc photos:
1. Diffuse thinning, focal narrowing, or notching of the optic disc rim, especially at the inferior or superior poles.
2. Localized abnormalities of the peripapillary retinal nerve fiber layer, especially at the inferior or superior poles.
3. Optic disc neural rim asymmetry of the two eyes consistent with loss of neural tissue.
4. Disc rim or peripapillary retinal nerve fiber layer hemorrhages.
4) Subject willing to comply with study requirements.
5) Subject who has signed an approved informed consent form.

Exclusion criteria

1) Patient unwilling or unable to give informed consent, or unable to return for scheduled protocol visits through 2 years.
2) Patient < 18 years or >85 years of age.
3) Patient is pregnant or nursing or unable to use appropriate birth control.
4) Vision level of no light perception.
5) Active iris neovascularization, active proliferative retinopathy or other ophthalmic disease that could confound study results.
6) Iridocorneal endothelial syndrome.
7) Epithelial or fibrous downgrowth.
8) Secondary glaucoma such as post-trauma.
9) Chronic ocular inflammatory disease.
10) Subject already enrolled in this or another study (only one eye can participate in this study) or completed their participation in another study within 30 calendar days of the screening exam.
11) Aphakia.

12) Vitreous in the anterior chamber.
13) Inability to obtain accurate IOP measurement throughout the study. For example: a history of corneal surgery, corneal opacities or disease/pathology (Active corneal infection or Fuchs dystrophy are examples.).
14) Prior ALT, SLT or MLT within 90 days of enrollment.
15) Severe anterior or posterior blepharitis.
16) Unwilling to discontinue contact lens use after surgery.
17) Previous incisional ophthalmic surgery, excluding uncomplicated clear corneal phacoemulsification (cataract) surgery at least 6 months prior to enrollment.
18) Presence of an anterior chamber IOL (AC-IOL).
19) Prior laser peripheral iridotomy.
20) Need for glaucoma surgery combined with other ocular procedures or anticipated need for additional ocular surgery during the investigational period.
21) Fellow eye with poorer than 20/200 best-corrected visual acuity (BCVA)
22) Known allergy or other contraindication to Mitomycin C (MMC) drug.
23) Angle closure glaucoma or narrow anatomical chamber angle as identified by gonioscopy and classified as Shaffer Grade 0 or 1.
24) Any condition that prevents the investigational device implantation or trabeculectomy in the superior region of the study eye (e.g., peripheral anterior synechiae, scleral staphyloma or conjunctival scarring).
25) Diagnosed degenerative visual disorders not associated with existing glaucoma condition (e.g., advanced dry or wet macular degeneration or other retinal disorders, central retinal artery or vein occlusion) or choroidopathy (e.g., choroidal detachment, effusion, choroiditis, or neovascularization).
26) Central corneal thickness that is less than 450 microns or greater than 620 microns.
27) Previous cyclodestructive procedure.
28) Prior retinal laser procedure conducted for any purpose other than treatment of retinal tear or hole.
29) Conditions associated with elevated episcleral venous pressure such as active thyroid orbitopathy, cavernous sinus fistula, Sturge-Weber syndrome, orbital tumors, orbital congestive disease.
30) Clinically significant sequelae from trauma (e.g., chemical burns, blunt trauma, etc.)
31) Ocular pathology or medical condition for which, in the investigator's judgment, the following factors would either place the subject at increased risk of complications or contraindicate device implantation or interfere with compliance to elements of the study protocol (e.g., ophthalmic examinations, follow-up visits),
a. inability to reliably complete visual field testing over the course of the study,
b. uncontrolled systemic disease (e.g. diabetes, hypertension) that could compromise their participation in the study.
c. Disorders that pose a fall risk, as well as compromise ability to take a visual field exam and take glaucoma medications (e.g., Parkinson's disease),
d. inability to discontinue use of blood thinners within the surgeon*s standard preoperative or postoperative instructions.
e. immunodeficiency concerns.
f. known corticosteroid responders whose pressure increases would not allow them to withstand the postop corticosteroid regimen.
32) Intraocular silicone oil.

33) Ocular steroid use in the planned study eye or systemic steroid use anytime within three months of the procedure. (This would not include the use of inhaled or dermatologic steroids.)
34) Chemotherapy within six months of the screening visit.
35) Use of oral hypotensive glaucoma medications for treatment of the fellow eye.
36) A requirement of general anesthesia for the procedure.
37) Bacterial conjunctivitis
38) Bacterial corneal ulcers
39) Endophthalmitis
40) Orbital cellulitis
41) Bacteremia or septicemia
42) Active scleritis
43) Uveitis
44) Severe dry eye syndrome
45) Severe myopia
46) Pseudo-exfoliative glaucoma

Study design

Design

Study phase:	4
Study type:	Interventional
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	28-05-2015
Enrollment:	25
Type:	Actual

Medical products/devices used

Generic name:	Innfocus MicroShunt® (MIDI Arrow)
Registration:	Yes - CE intended use

Ethics review

Approved WMO Date:	27-03-2015
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
ClinicalTrials.gov	NCT02177123
CCMO	NL50157.068.14