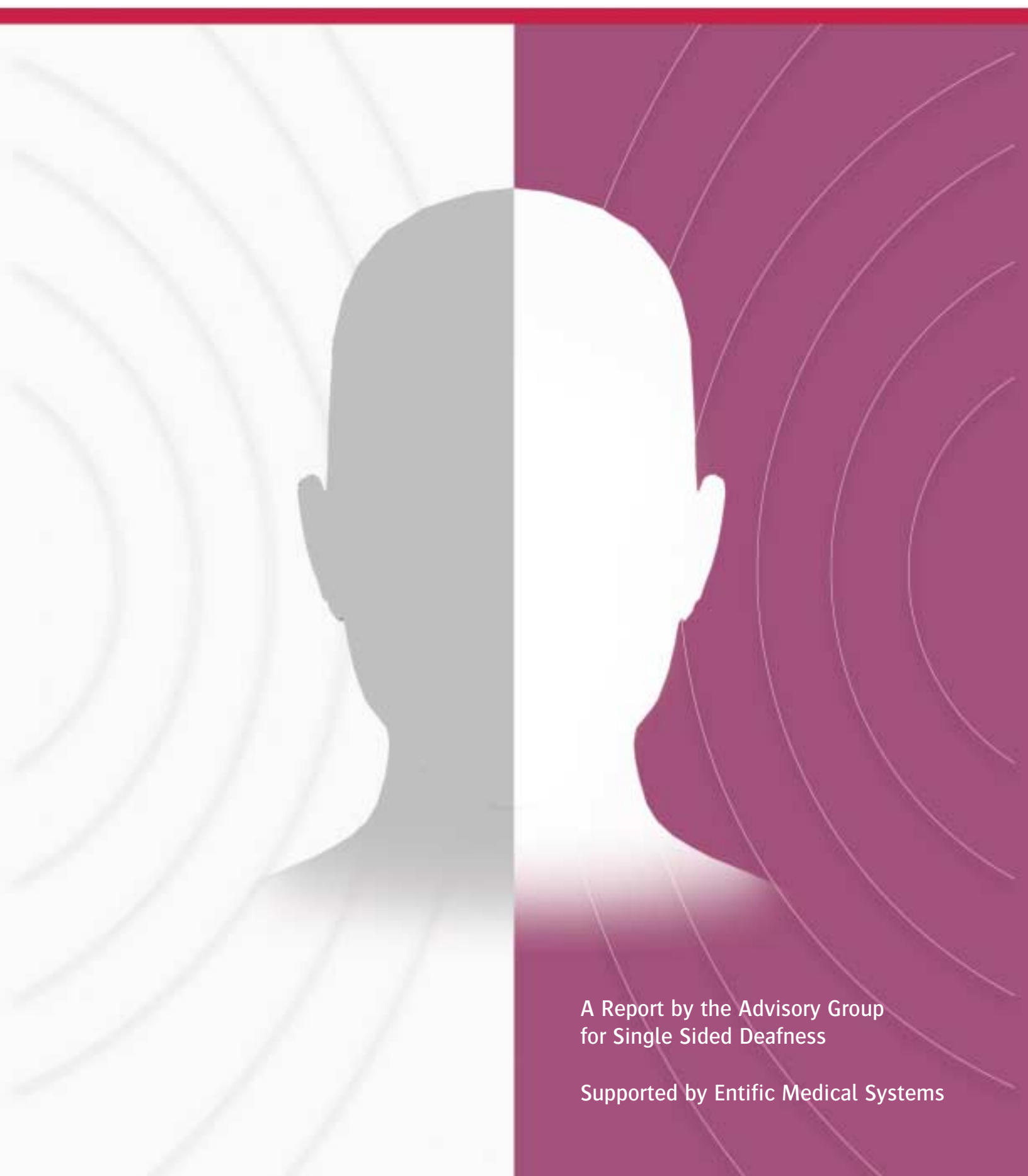


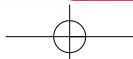
Hear the other side

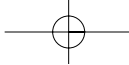
– a report on Single Sided Deafness



A Report by the Advisory Group
for Single Sided Deafness

Supported by Entific Medical Systems





A report on the causes, incidence, symptoms and problems associated with Single Sided Deafness and the provision of care available to people that suffer from the condition.

The report has been written by the Advisory Group for Single Sided Deafness, supported by Entific Medical Systems.

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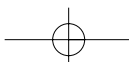
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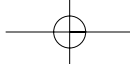
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March 2003





Executive Summary

Single Sided Deafness (SSD) refers to significant and usually permanent hearing loss in one ear. It is thought to affect at least 9,000 new people in the UK each year. Its most common cause is sudden deafness, which overwhelmingly results in SSD rather than bilateral deafness. Acoustic neuroma – a slow growing benign tumour of the auditory nerve – is another, though rare, cause of SSD.

For many sufferers, SSD has a disabling and debilitating impact on work, home and social interaction. An impaired ability to detect the direction of sounds, and to separate background noise from target sound, can make work and social situations painfully embarrassing for some patients: in a recent study, 24% of sufferers have had to give up work as a result of SSD, and feelings of social isolation and exclusion also occur.

Because SSD is not an officially recognised condition, awareness of SSD and its symptoms are inevitably low – even among some health professionals. This results in limited or delayed referral and diagnosis, and often the failure to provide support for patients. The misconception that hearing loss in one ear does not constitute a disability can aggravate its impact on patients and delay diagnosis and treatment.

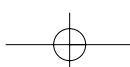
SSD cannot be cured but can be rehabilitated. However, awareness of treatment options is low, even among ENT and neuro-otology specialists, and even following treatment for acoustic neuromas. In fact two treatments are available: BAHA (a bone anchored hearing device) and a CROS aid (Contralateral Routing Of Signal), where patients wear a transmitter on the deaf ear and a receiver on the hearing ear; sound is transmitted via a wire connecting each unit.

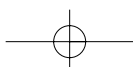
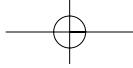
Both treatments can restore the sensation of hearing from the deaf side for SSD patients. It is generally said by patients that BAHA produces a better quality of sound than a CROS aid and can be easily hidden by hair. However, BAHA does require surgery to be fitted, a period of healing and continuous care of the implant.

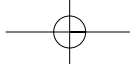
BAHA is not generally restricted in its availability by funding but CROS aids are. The availability of BAHA is restricted by theatre time and surgeon availability. Both treatment options are available throughout the UK.

It is recommended that:

1. Single Sided Deafness (SSD), the significant loss of hearing in one ear, should be recognised as a serious and potentially debilitating condition, which can be treated.
2. Treatment is available on the NHS, and privately, but is currently not widely offered. All SSD sufferers who need and want treatment should have access to it.
3. Patients wanting treatment for their SSD should consult their GP, who, once having ruled out local causes, should refer them to an ENT consultant.
4. BAHA is a highly effective treatment for SSD that is well accepted by patients. It should be made more widely available to SSD sufferers who could benefit from it and wish to do so.
5. GPs and other health professionals should be made more aware of SSD and the availability of BAHA treatment in order to encourage referral of appropriate patients.
6. To ensure the highest standards and best practice in assessment and treatment, the fitting of BAHA should be done at specialist centres that adopt BAHA surgical and audiological guidelines.
7. The publication of prospective and randomised clinical trials are highly recommended to increase the body of knowledge and the availability of evidence-based research into the treatment of SSD and to encourage widespread acceptance of the condition and the treatment options available.

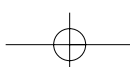


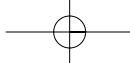




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1 Definition of Single Sided Deafness

Single Sided Deafness (SSD) refers to significant sensorineural hearing loss in one ear.

In most cases, Single Sided Deafness is a permanent condition. However, where Single Sided Deafness is caused by sudden deafness and hearing loss is only partial, some individuals find that their hearing returns, partially or fully, over a period of time.

2 Incidence of Single Sided Deafness

At present, Single Sided Deafness (SSD) is not formally recognised as a distinct form of deafness in the UK and as a result there are limited medical records from which to calculate the number of sufferers.

However, extrapolating figures from the United States, where SSD is recognised as a condition, it is estimated that at least 9,000 people develop Single Sided Deafness in the UK each year.

3 Causes of Single Sided Deafness

Single Sided Deafness may be a result of a number of different conditions each of which affects the ear differently. Causes of Single Sided Deafness include ¹:

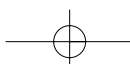
- **Physical damage to the ear**
- **Compression of the hearing nerve**
- **Inner ear problems including infections (viral or bacterial), tumours**
- **Disorders of the circulatory system**
- **Severe Ménière's disease**
- **Trauma, such as head injury**

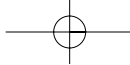
Sudden deafness (see box) is the most common condition to result in Single Sided Deafness. However, most cases of sudden deafness are not recorded. In some cases this is because patients do not seek treatment. In other cases patients are not referred to ENT for further investigation and treatment. Therefore, it is impossible to be certain of the total number of new cases each year. However, it is estimated that virtually all sudden deafness cases result in Single Sided Deafness as opposed to bilateral deafness.

Acoustic neuroma (see box) is a much rarer condition and it is estimated that it accounts for only a small percentage of SSD cases per year². However, though rare, acoustic neuroma is a widely studied condition and as a result, data exists on the impact of SSD on acoustic neuroma patients.

Other conditions that sometimes result in Single Sided Deafness are measles and mumps.

While different conditions have a unique variety of symptoms, the loss of hearing in one ear is common to all.





3.1 Sudden deafness

By definition, sudden deafness is rapid sensorineural hearing loss. It can be immediate in that the loss of hearing occurs all at once or it can happen over a period of up to 3 days. Hearing loss may vary from being mild to a total loss of hearing of the most intense sounds and it may be permanent (when associated with total Single Sided Deafness) or temporary (when associated with partial Single Sided Deafness) – spontaneously returning to normal or near normal over time. If a loss of at least 30 dB HL in three connected frequencies is discovered, it is diagnosed as sudden deafness (normal conversation is 60–65 dB). Nine out of ten cases of sudden deafness result in SSD.

There are many different causes of sudden deafness but only 10–15% of patients who develop sudden deafness know what triggered their hearing loss. Sometimes, the cause is attributable to a specific event or a diagnosis can be established using a patient's medical history.

Some possible causes include the following:

- **Trauma, such as a head injury**
- **Immunologic diseases such as Cogan's syndrome**
- **Ototoxic drugs (drugs that harm the ear)**
- **Disorders of the circulatory system**
- **Inner ear problems including infections (viral or bacterial), tumours**
- **Vascular problems/conditions leading to thrombosis, embolism or haemorrhage**
- **Metabolic disorders**

Sudden deafness can affect anyone, but for unknown reasons it happens most often to people between the ages of 30 and 60. A person who experiences sudden deafness should visit their doctor immediately.

(source: National Institute of Deafness and other Communication Disorders (U.S.A))

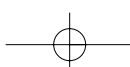
3.2 Acoustic neuroma

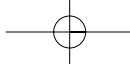
An acoustic neuroma is a slow growing, benign tumour of the auditory nerve. The condition is very rare and there are approximately 13 newly diagnosed cases, per million of the population, per year. Approximately 500 to 800 people are treated for acoustic neuroma in the UK each year. The cause of an acoustic neuroma is not known.

About 90%³ of patients with an acoustic neuroma will suffer from sensorineural hearing loss as their initial symptom. The hearing loss is usually gradual but in approximately 5% of cases, patients present as sudden deafness. The loss of hearing is due to a compression of the auditory nerve by the tumour. Some patients may present with good hearing but lose their hearing on one side following surgical intervention to remove the tumour. Other treatments, such as Gamma Knife, may not result in total hearing loss on one side.

In addition to a decline in hearing quality, other symptoms of acoustic neuroma may include facial sensations or tingling, loss of taste, loss of balance, watering eyes, severe headaches, aching teeth and a clicking jaw. In most cases, hearing is not restored after treatment.

(source: British Acoustic Neuroma Association)





4 Symptoms of Single Sided Deafness

Some symptoms of Single Sided Deafness are comparable with the symptoms of bilateral deafness. However, many are not. Patients with SSD often experience a number of disabling symptoms, in addition to hearing loss. These symptoms are primarily indicated in lifestyle/work situations and include:

- **Impaired ability to ascertain the direction of sound due to the head shadow effect (see fig. 1)**
- **Impaired ability to hear from the direction of the deaf side**
- **Impaired ability to separate background noise from target sound**

(See also specific symptoms described for sudden deafness and acoustic neuroma in boxes).

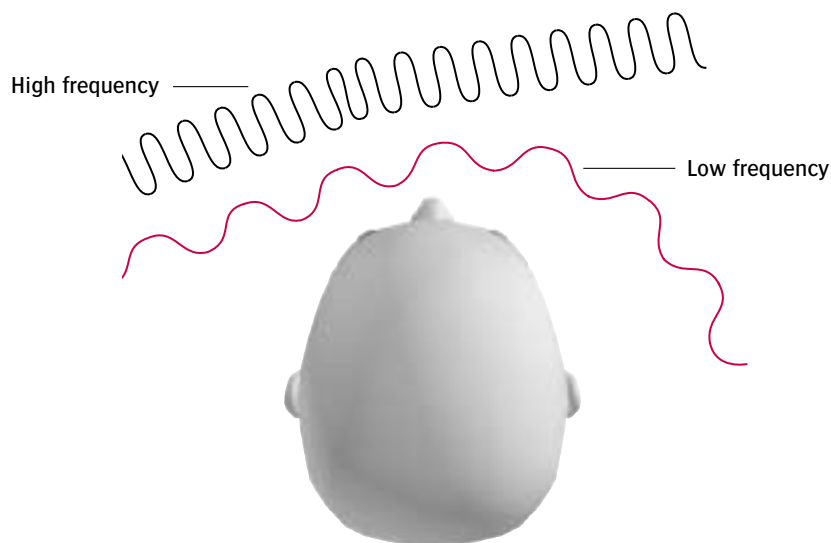
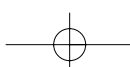


Figure 1:
Head shadow effect on low
frequency sounds vs. high
frequency sounds.

5 Effects on patients and lifestyle implications

For some patients, living with Single Sided Deafness is not a major problem. However, for many it is extremely debilitating and the lifestyle implications for people with SSD can be great.

The head acts as an acoustic barrier and causes a sound level difference between the two ears. Research has shown that high frequency sounds reduce in strength as they travel from the direction of one ear to the opposite ear⁴. For people with SSD, this can result in problems with comprehension and spacial discrimination. Entific Medical Systems conducted market research together with the members of the BANA (British Acoustic Neuroma Association) patient organisation in which 437 SSD acoustic neuroma patients participated. The study was designed specifically to ascertain the impact of Single Sided Deafness on the lives of sufferers. The study showed that Single Sided Deafness had made work more difficult for 39% of acoustic neuroma patients (*see table 2*) and almost one quarter of those questioned had been forced to stop working.



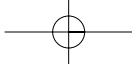


Table 1:
Finding a new indication for Single Sided Deafness: a study of acoustic neuroma patients by Through the Loop for Entific Medical Systems.

Single Sided Deafness also affects social interaction. In the Entific study, 45% of those questioned said that they are 'afraid of offending people by not hearing what is said'. An inability to hear what is being said or identify who is speaking can result in feelings of embarrassment, concerns about offending other people and ultimately a loss of confidence. In some cases, feelings of isolation and social exclusion can become so extreme that individuals with SSD are afraid to leave the house alone – 17% of acoustic neuroma patients have been affected so badly by Single Sided Deafness that they struggle to go anywhere unaccompanied. The effects and implications of SSD are particularly aggravated by the misconception that hearing loss in one ear does not constitute a disability.

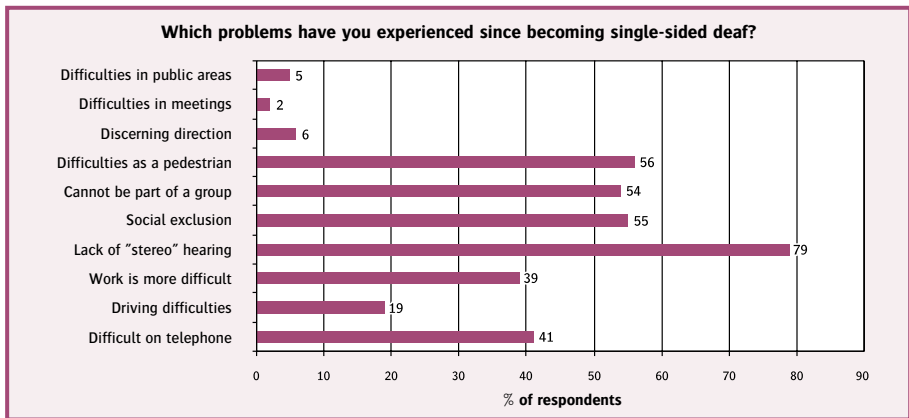


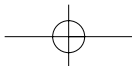
Table 2:
Finding a new indication for Single Sided Deafness: a study of acoustic neuroma patients by Through the Loop for Entific Medical Systems.

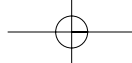
CASE STUDY

Janet, a 39 year old senior manager for MG Rover Group has been Single Sided Deaf since 1995, following surgery to remove an acoustic neuroma. SSD has had a substantial impact on Janet's life. It has affected her confidence and causes her to tire more quickly owing to the extra concentration that is required to hear in certain circumstances.

At work, Janet has to plan where to sit in a room and she finds that some places have to be avoided altogether. If she is unable to have control over a meeting environment, she sometimes loses the ability to participate effectively which she finds both problematic and very distressing. Since suffering from SSD, Janet does not mix much socially because pubs and restaurants by nature are noisy places. Several voices or sounds happening at the same time make it extremely difficult to isolate and pick out one sound from another.

Janet is frequently meeting new people but does not like to draw attention to her disability. Janet often finds herself making what she hopes are the 'right' grunts and facial expressions to fit in with the conversation that she thinks is taking place.

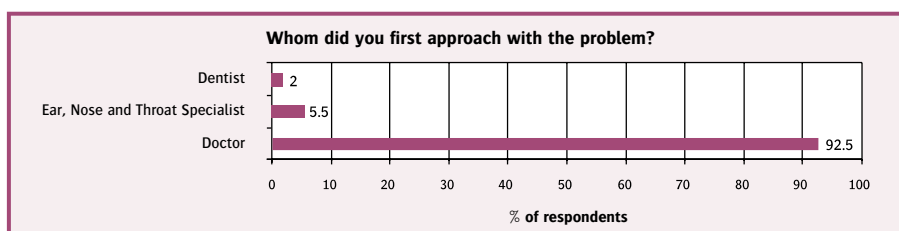




6 Diagnosis and referral

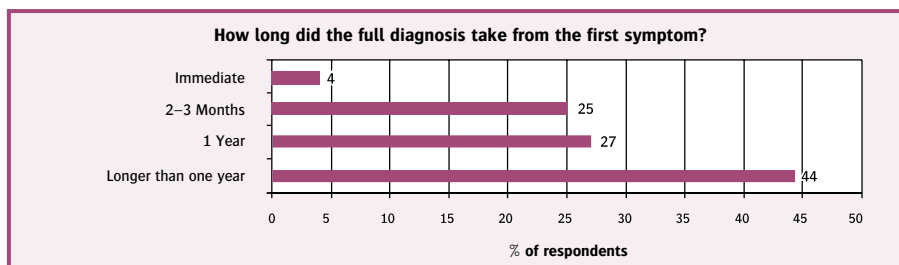
Depending on the symptoms experienced, most patients will initially contact their GP. The GP may then refer the patient to an ENT consultant who will arrange for an audiologist to assess the patient and determine the treatment. Where hearing loss is the result of head trauma, patients may be first referred to a neurologist. However, Single Sided Deafness is not an officially recognised condition so awareness of its symptoms and effect on patients is relatively low. As a result many patients that experience hearing loss in one ear might not be referred by GPs for further examination.

Table 3:
Finding a new indication for Single Sided Deafness: a study of acoustic neuroma patients by Through the Loop for Entific Medical Systems.



For some conditions, such as acoustic neuroma, investigating SSD further is essential for accurate diagnosis and prompt treatment. A delay in referral can extend accurate diagnosis by months or in some cases years. Similarly, diagnosis of other conditions that may result in SSD, such as severe Ménière's disease, can be hindered because other conditions present some of the same symptoms.

Table 4:
Finding a new indication for Single Sided Deafness: a study of acoustic neuroma patients by Through the Loop for Entific Medical Systems.

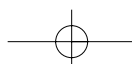


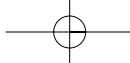
With the sudden onset of any hearing loss, a complete head and neck examination and a comprehensive audiological evaluation must be carried out. A doctor can estimate the magnitude of hearing loss with a standard hearing test. If a loss of at least 30 dB HL in three connected frequencies is discovered, it is diagnosed as sudden deafness (Normal conversation is 60–65 dB).

Other diagnostic tests to ascertain the cause of Single Sided Deafness might include a CT scan or an MRI scan.

Although it is usual to be referred for treatment within an NHS Primary Care Trust, patients can ask to be referred out of their locality, or may opt for private treatment.

At present, the waiting time from referral to assessment in the NHS can take 20 weeks and assessment will take a further 4–6 weeks.





7 Treatment of Single Sided Deafness

There is no cure for permanent, total Single Sided Deafness. However, there are devices available that can help restore the sensation of hearing from the deaf side. For the purpose of this report, these options are referred to as treatments.

Single Sided Deafness can be treated, irrespective of the length of time a patient has suffered from hearing loss. However, awareness of the treatment options – even among ENT and neuro-otology specialists – can be low. When a patient has been referred by a GP for further investigation, there is therefore a strong possibility that they will not be considered for treatment. For example, after treatment for an acoustic neuroma, 42% of patients surveyed by Entific Medical Systems were offered no treatment to help them hear from their deaf side. Understandably, however, three out of five people questioned would like the opportunity to receive treatment that could improve their hearing and therefore their quality of life.

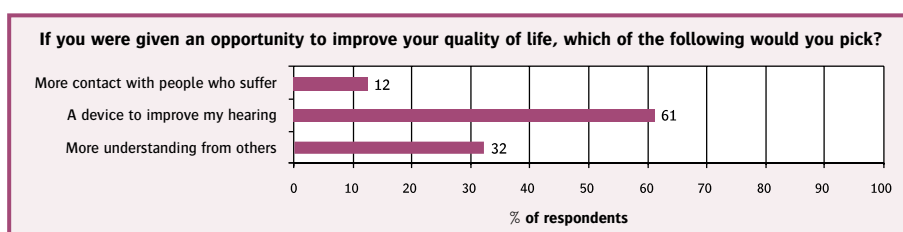


Table 5:

Finding a new indication for Single Sided Deafness: a study of acoustic neuroma patients by Through the Loop for Entific Medical Systems.

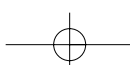
Once in the secondary care system, patients with Single Sided Deafness receive the same priority for treatment as patients with bilateral deafness and will join the same waiting list for treatment as patients with bilateral deafness. Ideally, eligibility for treatment of SSD should be partially assessed on the extent to which the hearing loss is a disability, on an individual basis. Therefore, it is logical for consultants and surgeons to rely on patients to articulate the scale and severity of their own disability; treatment is not necessarily recommended for all.

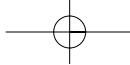
There are two common treatments for permanent Single Sided Deafness – BAHA (a bone anchored hearing device) and a CROS aid (Contralateral Routing Of Signal). Treatment is particularly suited to patients motivated to restore the sensation of hearing from their deaf side due to the impact of SSD on their lives and to patients motivated and able to clean and maintain their hearing devices.

The BAHA system

BAHA received FDA clearance for the treatment of total Single Sided Deafness in 2002. It has also been cleared to treat SSD when patients cannot, or for any reason will not, use a CROS aid.

BAHA is a semi-implantable bone anchored hearing device. BAHA has been available for over 25 years for all traditional bilateral conductive hearing loss indications and over 11,000 people have been treated with BAHA world-wide. To date 400 patients with Single Sided Deafness have been treated using BAHA in Europe and the USA.





How it works

The BAHA device works by transferring sound from the deaf side to the cochlea in the hearing ear, using bone conduction. The device has three main parts – an external sound processor, an abutment and a small titanium implant or fixture, which is placed in the skull bone, behind the deaf ear. The bone cells grow onto the surface of the titanium in a process called osseointegration. The abutment is then attached and the sound processor clipped onto the abutment. The sound processor transmits sound waves to the titanium fixture, which in turn causes the sound waves to travel through the skull and ultimately to the cochlea of the hearing ear, resulting in the sensation of hearing from the deaf side. A subtle difference in sound, combined with a minimal time delay associated with transmission gives the user the necessary temporal cues to help determine from which side the sound originated (*see fig. 2*).

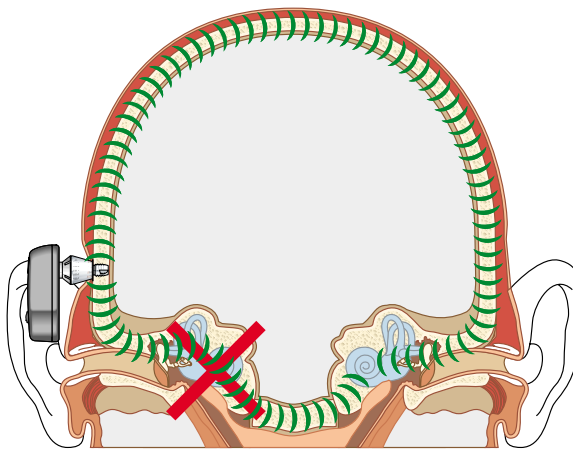


Figure 2:
BAHA: Sound waves travel through the skull from the deaf side to the functioning cochlea on the opposite side.

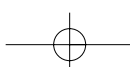
Fitting

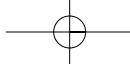
An ENT Consultant implants the fixture into the skull bone and fits the abutment. The procedure to implant the fixture and abutment takes about an hour and is done under anaesthetic. An audiologist will attach the sound processor after a further three months (up to six months for children). The processor can be easily removed and reattached by the patient whenever necessary. The audiologist will spend some time with the patient explaining the product, how to use it, after-care and hygiene and answer questions.

The fitting of a BAHA should be done at specialist centres that adopt BAHA surgical and audiological guidelines (*see fig. 3*).



Figure 3:
The BAHA device has three main parts: an external sound processor, an abutment and a titanium implant.





Suitability

Any individual with significant hearing loss in one ear and normal, or close to normal, hearing in the other ear may be suitable for a BAHA. However, to gain the full benefits from the treatment, patients must be compromised by their SSD and highly motivated to restore the sensation of hearing from their deaf side. In addition, they must be able to clean the area around the abutment, or have someone who is able to clean and maintain it for them.

All patients can be referred to be fitted with a BAHA device, at the request of an ENT surgeon. However, the waiting time for treatment may be longer for patients not in the vicinity of a BAHA centre. There are now a number of centres of excellence in the UK, which in total fit some 800 patients with BAHA every year.

Research has indicated an 88% satisfaction rate for BAHA for SSD and an increase in spacial discrimination of 5–15 dB when wearing the BAHA device⁵. Research also indicates that the BAHA device is worn for an average of 8–9 hours per day⁶.

CROS aid

A CROS (Contralateral Routing Of Signal) aid is made up of two instruments – a microphone (transmitter) and a hearing aid (receiver). Patients wear the transmitter on the deaf ear and the receiver on the hearing ear (*see fig. 4*). Sound is transmitted via a wire connecting each unit, infra-red or radio frequency. Almost all CROS aids fitted in this country use a wire to transmit sound. As with a BAHA device, the time delay associated with the transmission gives the user the necessary temporal cues to help determine from which side the sound originated. If a person has a degree of hearing loss on the hearing side as well, amplification can be added to the receiver side as well as the transmitter, creating what is known as a “BICROS” aid.

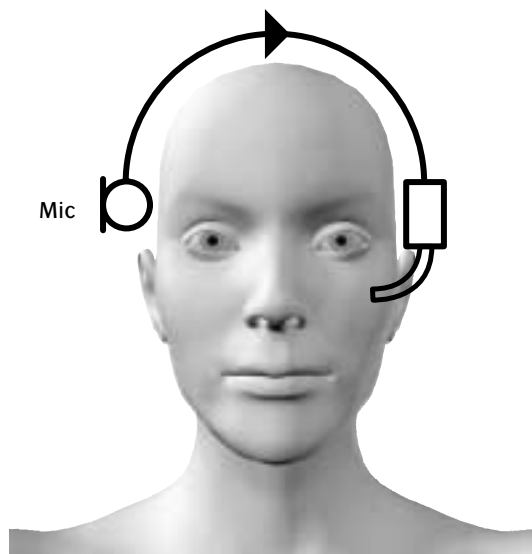
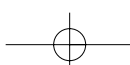
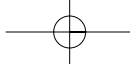


Figure 4:
CROS (Contralateral Routing Of Signals). Microphone on the deaf side – amplifier and receiver on the side with normal hearing.

At present, the waiting list for treatment of hearing loss (unilateral or bilateral) varies from centre to centre but patients can be expected to wait up to one year for treatment on the NHS. This is in addition to the waiting time for assessment.





8 Funding and regulation

Treatment for Single Sided Deafness is available on the NHS.

BAHA

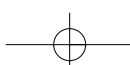
Funding levels for BAHA vary between Primary Healthcare Trusts, but funding is not necessarily a restricting factor in the number of BAHAs that are fitted each year. Other limitations can be a lack of available theatre time and the fact that surgeons' time has to be allocated across a number of other treatments as well as BAHA.

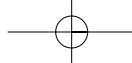
The number of patients treated with BAHA will vary from region to region. Where a patient has been referred to a surgeon from outside the Primary Healthcare Trust, the visiting patient's Primary Care Trust will be asked to pay for the treatment. Authority to sanction funding ultimately lies with the hospital business manager.

Fitting of the BAHA device is available privately and on some private health insurance policies, depending on the terms of the policy. In some cases, insurance companies will pay for the surgery only but the patient must purchase the BAHA device. In a very few cases insurance companies have paid for both the procedure and the hearing device. The cost of having the BAHA device fitted privately varies from patient to patient: an approximate cost is £5,000.

CROS aid

Availability of CROS aids varies between NHS audiology departments and is dependent on the level of funding. CROS aids are purchased in the same way as regular hearing aids through audiology departments.





9 Conclusions and recommendations

Single Sided Deafness affects at least 9,000 new people in the UK each year and for many its symptoms have a disabling and debilitating impact on work, home and social interaction. However, SSD is an under-recognised condition. Therefore, awareness of SSD and its symptoms is inevitably low – even among some health professionals. As a result, the provision of support for patients is lacking, often resulting in limited or delayed referral and diagnosis.

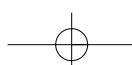
SSD can be rehabilitated but knowledge of the treatment options available is not widespread. Both BAHA and CROS aids can restore the sensation of hearing from the deaf side for SSD patients. It is generally said by patients that BAHA produces a better quality of sound than a CROS aid and can be easily hidden by hair. However, BAHA does require surgery to be fitted and a period of healing. The patient also requires instruction on a simple hygiene routine to keep the site free from infection.

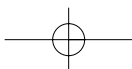
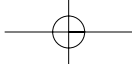
BAHA is not generally restricted in its availability by funding but CROS aids are. However, the availability of BAHA is restricted by theatre time and surgeon availability. Both treatment options are available throughout the UK. However in the case of BAHA, referral outside an NHS Trust may be required.

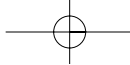
Treatment of SSD is most suited to patients who find their loss of hearing particularly disabling. Eligibility for treatment is determined by an ENT surgeon and relies on the ability of the patient to communicate the scale and severity of their disability.

To address these concerns, the Advisory Group for Single Sided Deafness recommends:

1. Single Sided Deafness (SSD), the significant loss of hearing in one ear, should be recognised as a serious and potentially debilitating condition, which can be treated.
2. Treatment is available on the NHS, and privately, but is currently not widely offered. All SSD sufferers who need and want treatment should have access to it.
3. Patients wanting treatment for their SSD should consult their GP, who, once having ruled out local causes, should refer them to an ENT consultant.
4. BAHA is a highly effective treatment for SSD that is well accepted by patients. It should be made more widely available to SSD sufferers who could benefit from it and wish to do so.
5. GPs and other health professionals should be made more aware of SSD and the availability of BAHA treatment in order to encourage referral of appropriate patients.
6. To ensure the highest standards and best practice in assessment and treatment, the fitting of BAHA should be done at specialist centres that adopt BAHA surgical and audiological guidelines.
7. The publication of prospective and randomised clinical trials are highly recommended to increase the body of knowledge and the availability of evidence-based research into the treatment of SSD and to encourage widespread acceptance of the condition and the treatment options available.

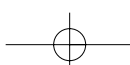


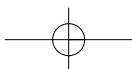
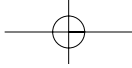


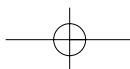
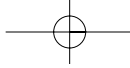


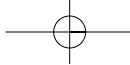
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C O N T A C T

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