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INSTITUT CHIARI  
& SIRINGOMIELIA  
& ESCOLIOSIS  
DE BARCELONA

HIGHLY SPECIALISED NEUROSURGICAL CENTRE



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# Accreditations

Quality Management certified by



R&D centre certified by



Innovate SME certified by



Professional Society authorised by



Centre accredited by



Medical Office authorised by



Continued training programs (Spain, 2014) accredited by



Continued training program (Poland, 2015) accredited by



Partner Hospital CIMA Barcelona accredited by



# Letter from the Director



After having started out as a direction of research in the neurosurgical field in the mid-seventies, in 1992 the theoretical foundations were established with a doctoral thesis and in 1993 the first patient underwent the Sectioning of the Filum Terminale surgery with a minimally invasive technique.

This path led to the creation of today's foundations of the *Institut Chiari & Siringomielia & Escoliosis de Barcelona* and of the health method *Filum System*<sup>®</sup>, a system that is protocolised, registered and accredited as a means of quality guarantee and applied exclusively at our centre.

The method is designed for the diagnosis and treatment of a new condition, the *Filum Disease*. The fourth of the sixteen protocols that make up the *Filum System*<sup>®</sup> describes the new, minimally invasive surgical technique of the Sectioning of the Filum Terminale.

Currently, after 40 years of research and 24 years of application of the method, the *Institut Chiari & Siringomielia & Escoliosis de Barcelona* has more than 1300 patients from all around the world that have undergone surgery according to the *Filum System*<sup>®</sup> with excellent results and a 94% satisfaction rate; an important achievement for Medicine and a source of hope for many patients.

Excellence is fundamental for us in all aspects of medical practice, from the first patient contact to the diagnosis, from the treatment to check ups in the years following the procedure, combining the human aspect with the strictly scientific. The mission of the *Institut Chiari & Siringomielia & Escoliosis de Barcelona* cannot end here, it is our professional and scientific duty to promote and apply the *Filum System*<sup>®</sup> at the highest level.

The *Filum Academy Barcelona*<sup>®</sup> and the *Chiari & Scoliosis & Syringomyelia Foundation* were created for this purpose, dedicated to teaching and spreading knowledge on the *Filum System*<sup>®</sup>, as well as to social aid.

Our Institute in Barcelona is an international reference, planning into the future since its beginnings, where scientific research and medical practice advance side by side with the common goal of care efficiency for the well-being of the patient.

A handwritten signature in blue ink, which appears to read 'Miguel B. Royo Salvador'.

Miguel B. Royo Salvador, MD, PhD  
Neurologist, Neurosurgeon, Neuroscientist  
Director

Institut Chiari & Siringomielia & Escoliosis de Barcelona





# INSTITUT CHIARI DE BARCELONA



## Institut Chiari & Siringomielia & Escoliosis de Barcelona

First Centre with Filum System® Accreditation

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### Mission

To cure or alleviate spine conditions in the most effective way, with the best and least invasive techniques, with short recovery times and an early application.

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### Vision

To offer patient care that has the patients' health as a whole at its centre, always based on the patients' needs and expectations, enabling mediation and therapeutic alliance.

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### Values

Therapeutic innovation, clinical excellence and continuous improvement: our specialised professional team cultivates the highest level of human, technical and scientific quality as well as effectiveness in the treatments it recommends.



# Filum System®

## What is it?

The *Filum System*® is a worldwide pioneering health method that includes 16 clinical action protocols for the diagnosis and treatment of the *Filum Disease*.

## What does it offer?

As quality guarantee for an excellent medical practice, the *Filum System*® method holds since 2013 a trademark accreditation. It offers the best current surgical techniques and specific and personalised following up of the post-surgery check-ups and subsequent rehabilitation.

## It involves

With 40 years of research and 24 years of application in more than 1300 patients, the method is based on studies and etiopathogenic evidence. Training and accreditation takes place at the *Filum Academy Barcelona*®.







## Services

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### Integrated Unit

At our Spinal and Nervous System Care Unit, all diagnostic and care elements needed for a successful treatment and follow up are employed and coalesce.

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### Patient Care in 15 languages

The staff that we have at our disposal is specialised in translation, mediation and communication and is clinically trained for in and outpatient care.

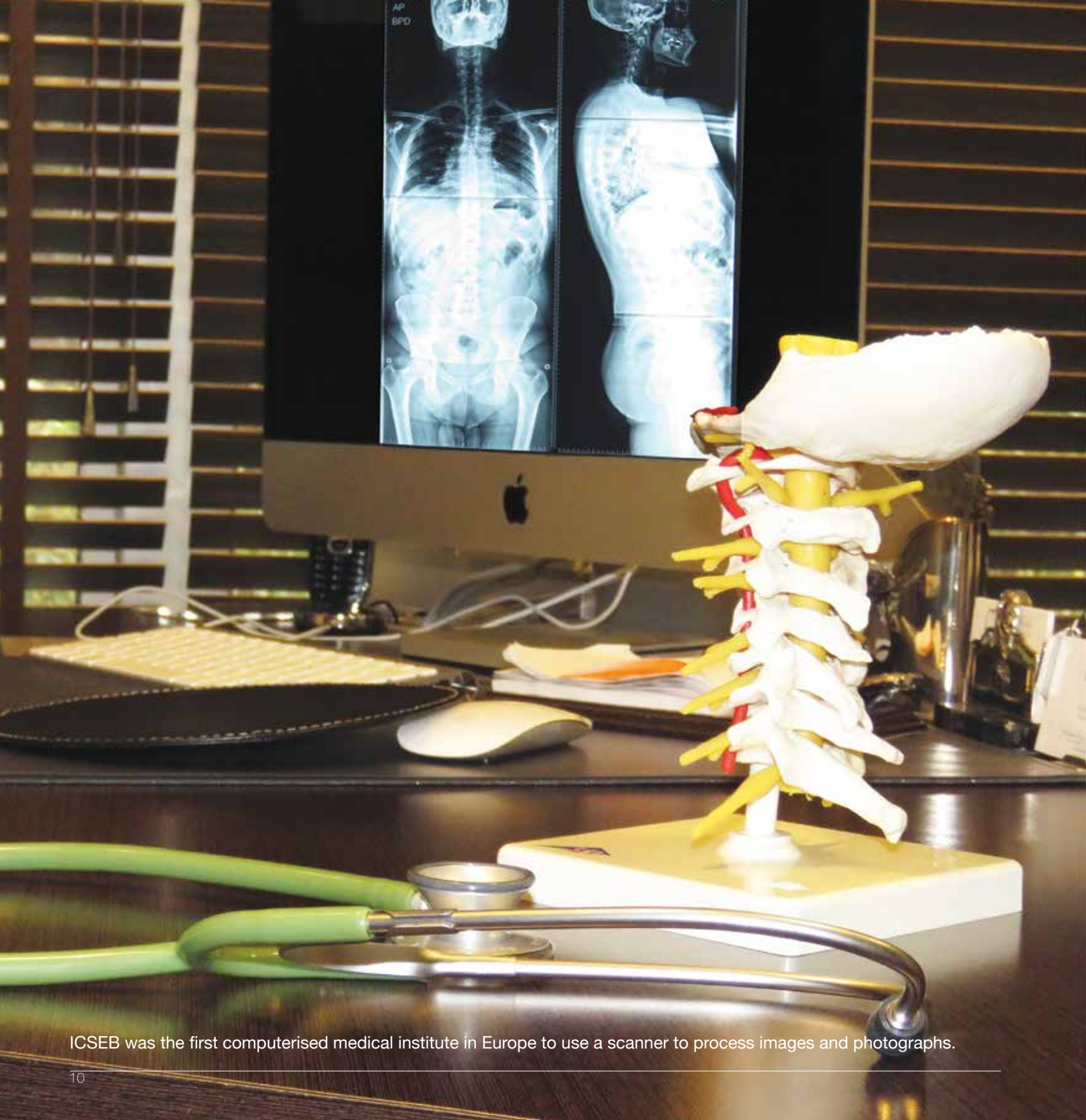


### Administrative Department

The Admin Department assists with the necessary proceedings at national and international level and provides patient support whenever needed, with a quality management that is geared towards continuously improving our services.







ICSEB was the first computerised medical institute in Europe to use a scanner to process images and photographs.

## Diseases we treat

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### New Diagnostic Interpretation

The *Institut Chiari & Siringomielia & Escoliosis de Barcelona*, contributes new interpretations for different spinal and brain diseases in a highly specialised medical and surgical field.

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### Area of High Neurosurgical Specialisation

The *Institut Chiari & Siringomielia & Escoliosis de Barcelona* is the only centre holding the accreditation for the application of the *Filum System*<sup>®</sup>. It treats all conditions related to the *Filum Disease*, including: the Arnold-Chiari Syndrome Type I, Idiopathic Syringomyelia and Idiopathic Scoliosis, Basilar Invagination, Platybasia, Odontoid Retroflexion, Brainstem Kinking and other associated conditions such as different idiopathic deviations of the spine.

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### Other Conditions

Cervical herniated disc, thoracic herniated disc, lumbar herniated disc, spinal canal stenosis, vertebral luxation, facet joint syndrome, peripheral nerve disease and others.





Pre-SFT 2015.03.06

Post-SFT 2016.05.04



ICSEB – Case 15215:  
5-year-old boy affected by I.SCO, DCT, I.SM and Odontoid Retroflexion. Images of the scoligram before and after the application of the Filum System®.

## Idiopathic Scoliosis

### Deviation of the Spine

Idiopathic Scoliosis (I.SCO) is a lateral deviation of the spine; it is more frequent in the feminine gender and tends to show in the age of growth.

### According to the Filum System®

I.SCO is the result of a three-dimensional avoidance or compensation mechanism reacting to the cord traction produced by a tense Filum Terminale that is undetectable on the neuroimaging. The same cause is shared with other idiopathic deviations of the spine of equal biomechanical significance, such as hyperkyphosis, hyperlordosis, straightening of the spinal curvature, vertebral rotation and the inversion of the spinal curvature.

### Symptoms

Lower back pain, upper back pain, cervical pain, gait alterations, limitation of mobility of the back and paraesthesias.





# Arnold-Chiari Syndrome Type I

## Descent of the Cerebellar Tonsils

The Arnold-Chiari Syndrome indicates the herniation of the lower part of the encephalon and the cerebellum, the cerebellar tonsils, through the foramen magnum towards the spinal canal. In the ACHS Type I (ACHS.I), there is a descent of the cerebellar tonsils (DCT) without any other related malformation of the nervous system or spine.

## According to the Filum System®

The DCT in the ACHS.I is the result of an abnormal spinal cord traction due to an anomalous Filum Terminale, undetectable on the neuroimaging.



## Symptoms

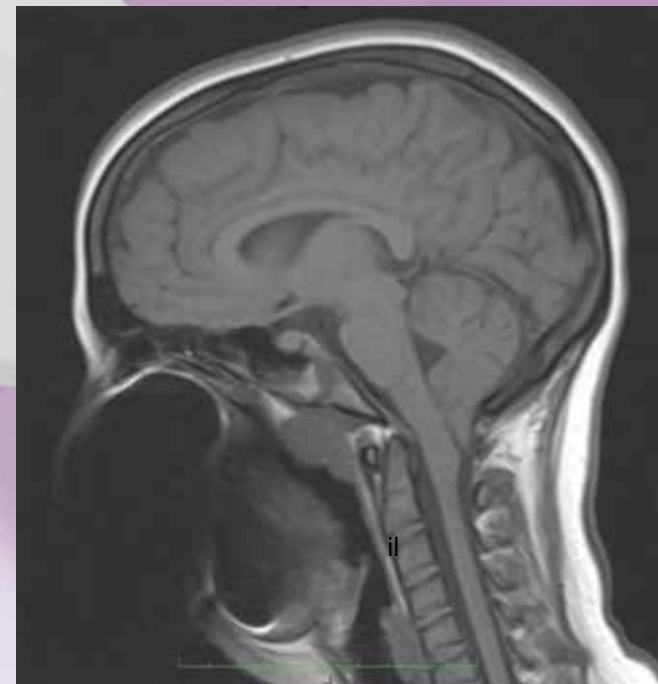
These are the most frequent symptoms among our caseload: headaches, vertigo, nausea, vomiting, neck pain, dysphagia, insomnia, concentration and memory disturbances.



Pre-SFT 2011.02.08



Post-SFT 2012.02.13



ICSEB – Case 14183:  
10-year-old girl affected by the ACHS.I. MR images from before and after the application of the Filum System®.

Pre-SFT 2009.10.22

Post-SFT 2013.10.01

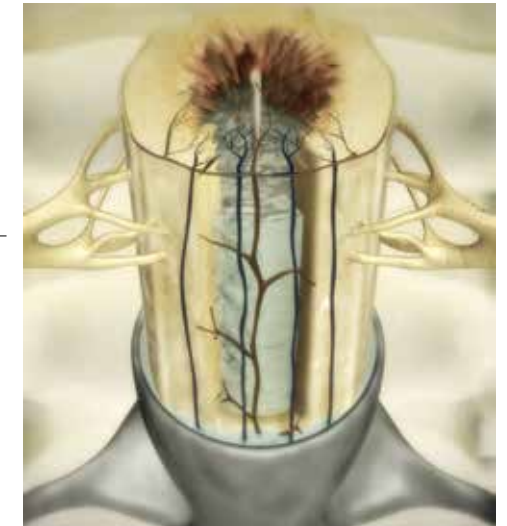


ICSEB – Case 19793:  
40-year-old woman affected by ACHS.I, I.SM, I.SCO. Sagittal MR images of the cranio-cervical region from before and after the application of the Filum System®.

## Idiopathic Syringomyelia

### Intramedullary Cyst

Idiopathic Syringomyelia (I.SM) is characterised by the appearance of a cystic cavity inside the spinal cord, filled with fluid and accompanied by symptoms of general spinal cord deterioration, predominantly sensibility alterations.



### According to the Filum System®

I.SM is the consequence of the necrosis or destruction of intramedullary tissue, induced by the lack of blood flow in the spinal cord, which in turn is caused by spinal cord traction due to a tense Filum terminale, undetectable on neuroimaging. The Syringomyelia Cavity (SC) is filled with interstitial fluid or serum with proteins, result of the tissue lysis. The SC can fistulise into the perimedullary space or ependymary canal during its course and exchange the intracavitary serum with cerebrospinal fluid (CSF).



### Symptoms

Thermal and tactile sensibility disturbances, paraesthesias, tingling, atrophies, loss of strength, gait disturbances, instability, and pain in extremities.





Depiction of the most frequent conditions that make up the Filum Disease: the Arnold-Chiari Syndrome, Scoliosis and Syringomyelia.

# Filum Disease

## Neuro-Cranio-Vertebral Syndrome

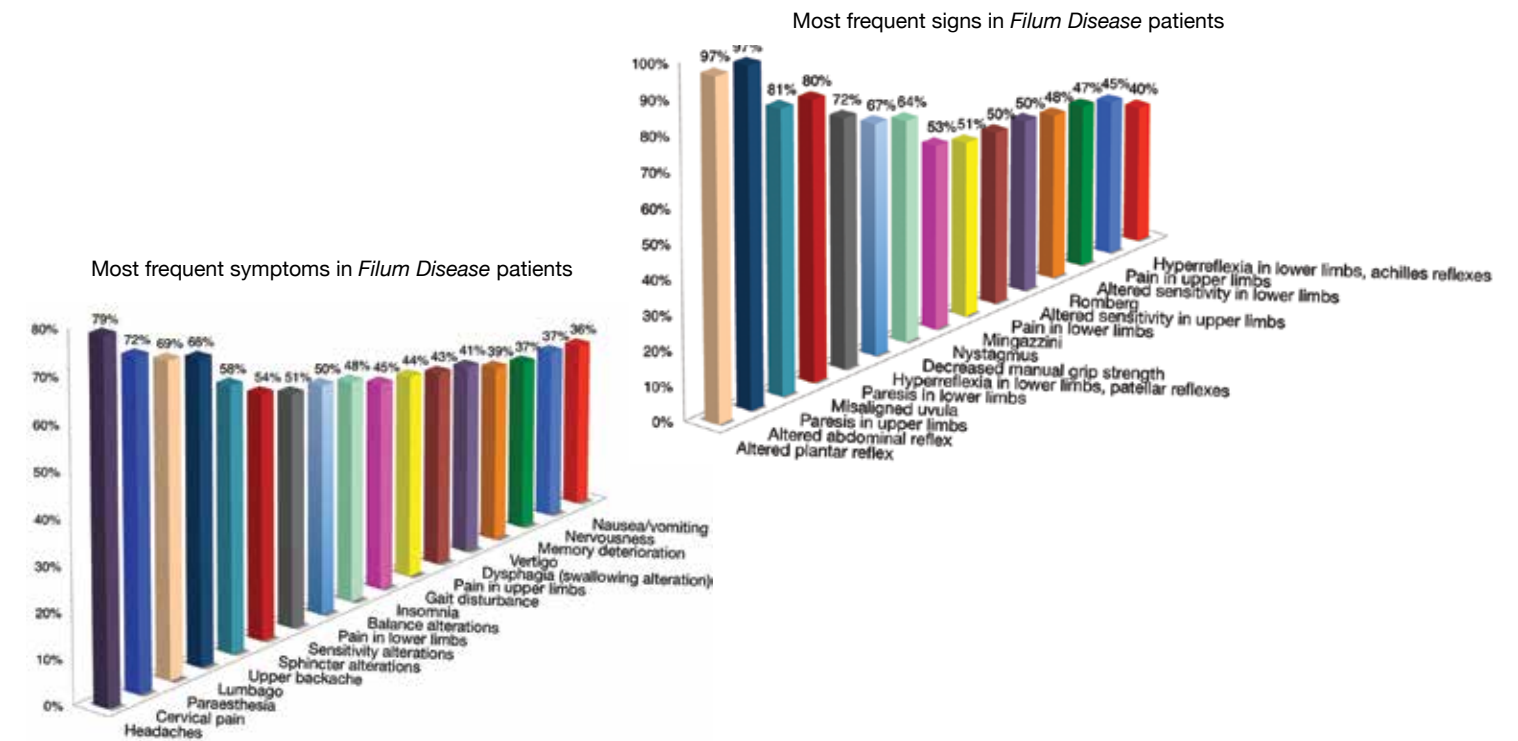
The *Neuro-Cranio-Vertebral Syndrome (NCV.S)* is a set of clinical manifestations, symptoms and signs that affect the entire nervous system, including the encephalon, the brainstem, the spinal cord, the skull and the spine, that are the consequence of the abnormal traction exerted by the Filum Terminale due to different causes: traumatic, degenerative, congenital, malformative, infectious, tumorous.

## Filum Disease

The *Filum Disease* is a NCV.S due to a congenital anomaly of an apparently normal Filum Terminale causing traction on the spinal cord and the rest of the nervous system. This is the most frequent kind of NCV.S.

## How does it manifest?

As the Arnold-Chiari Syndrome Type I, idiopathic Scoliosis and idiopathic Syringomyelia and others, which are expressions of this disease and can share the same symptoms.







## Treatments

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The *Filum System*<sup>®</sup> method offers a new surgical solution for the *Filum Disease* and thus for idiopathic Scoliosis, idiopathic Syringomyelia and the congenital Arnold-Chiari Syndrome Type I and other included conditions:

**The new minimally invasive surgical technique of the Sectioning of the Filum Terminale.**

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### What does it entail?

A small opening of the sacrum bone is performed; the inconvenience of altering the mechanism of the spine does not exist here. The surgeon visualizes the Filum Terminale and sections it with a microsurgical technique.

The surgical time is reduced to 45 minutes.

The possibility of complications is minimal.

The hospitalisation lasts few hours.

Short post-operative period without restrictions.



### Advantages

Eliminates the disease's cause: the tension produced by the Filum Terminale ligament.

Improves the symptoms and halts the disease's course.

In ACHS.I: eliminates the risk of sudden death.

In I.SM: halts the dying of cells that is due to the spinal cord traction and decreases the tumorous effect of the cyst as the spinal cord relaxes.

I.SCO: the force that the spinal cord is subject to ceases and the latter stops sending stimuli of flexion to the spine, so halting the progression of the spinal curvature.

Improves the blood flow and the trauma caused by the traction altering the functions of the entire Nervous System.





ICSEB offices.  
From left to right: Dr Royo and Dr Salca.

## Other Surgical Procedures in the Filum System®

The *Filum Disease* can express itself with multiple related conditions that require different surgical treatments; the most frequent ones are:

### Craniocervical Junction Malformations

Craniocervical malformations such as Platybasia, Basilar Invagination and Odontoid Retroflexion can cause an important stenosis in the foramen magnum or the upper part of the spinal canal in such a way as to jeopardise the nervous structures that are contained within mechanically, such as the pons, the medulla oblongata, the cerebellum and the upper part of the spinal cord. The way to treat these would be by means of a suboccipital craniectomy, or the removal of the odontoid process with posterior stabilisation by means of fusing 0-C1-C2. In our extensive case-load, we have not encountered any case requiring such a surgical attitude once the *Filum System*® had been applied.

### Spinal Disc Herniations and Protrusions

The increased intradiscal pressure, due to the spinal traction force, makes it easier for the annulus fibrosus of intervertebral discs to experience an early rupture triggered by minor efforts or weight-lifting. Disc herniations and protrusions are therefore more frequent in the *Filum Disease* / *Neuro-Cranio-Vertebral Syndrome (FD/NCV.S)*.

The treatment regiment for patients affected by the FD/NCV.S and associated disc herniations for the most part is to apply only the Sectioning of the Filum Terminale (SFT) and to observe the clinical course of the disc herniation-protrusion, except for those cases with intense manifestations of pain or a manifest neurological deficit related to the herniated disc. In this case, the extirpation is indicated for the same surgical session. If once the SFT has been performed, and the disc herniation was not operated on in the same session, the symptomatology persists or deteriorates, the surgical removal of the disc herniation will be indicated subsequently. The basis of this attitude is the experience that in several occasions, when the indicated herniated disc surgery could not be performed due the patient's personal circumstances, the clinical and neuroimaging course of the disc herniations-protrusions was positive and there was improvement. In the case of lumbar and thoracic disc herniations, the most employed technique is the discectomy by means of semi-hemi-laminectomy for lumbar discs and the transarticular approach for the thoracic disc; in the case of cervical disc herniations it is anterior discectomy with placement of a graft or intersomatic cage.



## Other Surgical Procedures in the Filum System®

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### Spinal Stenosis

An overload of the vertebral units by the spinal cord traction force causes the vertebral union to collapse by folding the ligaments and the articular tissue protrudes towards the spinal canal together with degenerative processes that contribute to narrowing the spinal canal. The most employed surgical technique is the laminectomy.

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### Spinal Fusion

Spinal fusion by instrumentation with metal prostheses on the vertebral column means a great technical-surgical advance that allows finding a solution in cases of important spinal injury that would otherwise have a precarious destiny. The improvement of the surgical technique and of the implants currently allows this to be a customary treatment that can sometimes slide into being overly recommended due to the surgeons' good skills and the commercial pressure from the implant manufacturers' side.

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### Facet Joint Syndrome

The axial impact of the vertebral unit, consequence of the spinal cord tractive force, causes a dysfunction of the recovery mechanism of the intervertebral discs in the lying position and therefore minimises or eliminates the restorative effect of the ordinary night's rest. The stress accumulation predisposes the annulus fibrosus of the intervertebral disc to break and therewith disc herniations together with the decrease of the height of the intervertebral space. This causes an impact of the interapophyseal joints, which in turn is responsible for back pain that may or may not irradiate into the lower extremities and can be limiting or occasionally even disabling.

Rhizolysis through surgical diathermy or chemical coagulation is recommended in case of a pain symptomatology that persists after a Sectioning of the Filum Terminale (SFT). In the more than 1300 cases of *Filum System*® application, four rhizolysis have been performed; two through surgical diathermy and two chemical ones.

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### Baastrup's Syndrome

The same axial impact mechanism that affects the intervertebral discs and the interapophyseal joints also causes the spinous process to impact. This manifests with vertebral pain with mechanical characteristics that ceases in lying position and increases with overload. It improves after the SFT, up to date, after more than 1300 cases, we have not carried out any specific surgical therapy for Baastrup's syndrome.



# Outcomes and Success Rates of the Filum System®



## Surgical Techniques

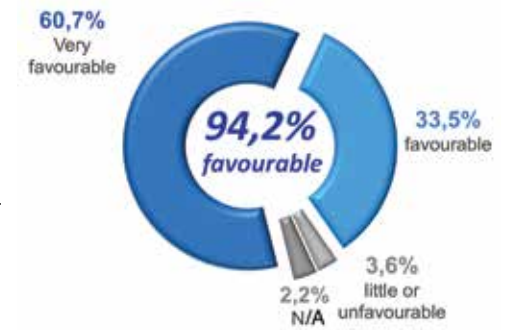
At the *Institut Chiari & Siringomielia & Escoliosis de Barcelona*, we apply minimally invasive techniques with the best post-operative outcomes whilst preserving utmost efficiency.

## Outcomes

Excellent clinical and surgical results, no relevant complications. The cause of the conditions is eliminated, the course of the diseases is halted and quality of life is improved.

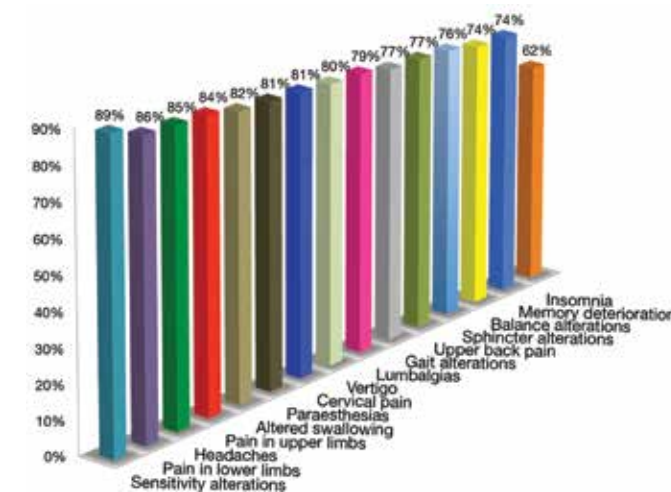
## Success Rates

High patient satisfaction rate: 94.2%.

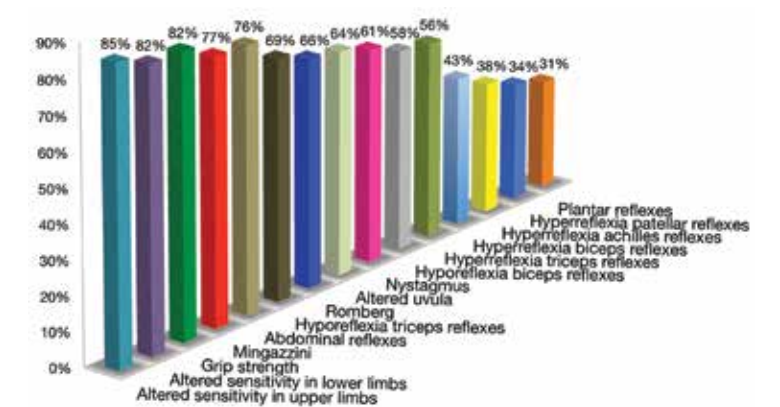


*Filum System®* satisfaction rate.

Improvements in symptoms of the *Filum Disease* after the application of the *Filum System®*



Improvements in clinical signs of the *Filum Disease* after the application of the *Filum System®*



# Research and Development (R&D) Department

## Science Applied to Medicine



The *Research and Development (R&D) Department of the Institut Chiari & Siringomielia & Escoliosis de Barcelona (ICSEB)* was officially established in 2014 as a result of the ongoing investigative work that accompanies the day-to-day clinical activities at ICSEB and continues the research effort its founder has been carrying out since the 1970s.

Holding R&D accreditations by ACIE and ENAC since 2011, the R&D department aims to provide research, publications and dissemination of the new clinical concepts that are applied at ICSEB for the entire international scientific community.

Given that development in any area of medicine relies on research that supports its growth and evolution, the activity of research and development in biomedicine is necessary for the success of any strategy that aims to improve the health of patients and increase the potential beneficiaries of these treatments.

On this basis, ICSEB is highly committed to the integration of R&D with clinical practice aiming to increase the effectiveness of the treatments and the knowledge of factors related to the treatment of diseases associated to the Filum Terminale, increasing the success rates and minimising the risk of the surgeries.

As the worldwide pioneer in the application of an unique and exclusive technique, supported by our own scientific studies with the highest academic distinction, ICSEB's R&D projects intend to obtain the best scientific evidence to enable the continuous improvement of treatments, the amplification of knowledge of physio-pathological anatomy and the development of new clinical techniques.





## Filum Academy Barcelona®



Closing ceremony of the 2<sup>nd</sup> international course “Diagnosis and Treatment of the Filum Disease”.

The *Filum Academy Barcelona*® was constituted in 2014 with the purpose of teaching and accrediting health care professionals in the application of the *Filum System*® health method.

The Academy is located within the *Institut Chiari & Siringomielia & Escoliosis de Barcelona* premises and offers highly specialised courses for physicians, specialists and healthcare professionals, whilst offering personalised language and organisational solutions according to demand.

For more course information, please contact:

Secretariat:

Email: [info@filumacademybcn.com](mailto:info@filumacademybcn.com)

Tel.: (+34) 93 280 08 36



## Facilities of the Institut Chiari & Siringomielia & Escoliosis de Barcelona and Partner Centres



Our clinical and outpatient activities are mainly held at the *Institut Chiari & Siringomielia & Escoliosis de Barcelona (IC-SEB)* located at Paseo Manuel Girona 16, Barcelona, Spain. Hospital admission, additional tests and surgical procedures take place at partner facilities.

Partner Hospital CIMA Barcelona

