Italian Journal of Sports Rehabilitation and Posturology

1904

Ita. J. Sports Reh. Po.

Italian Journal of
Sports Rehabilitation and Posturology

The "Pusher " syndrome, assessment and treatment. Part 1

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Abstract

In an Nursing home the number of individuals with an severe stroke with the Pusher syndrome are much more than in Rehabilitation center. This person with an severe Pusher syndrome are present on the geriatric rehabilitation ward but also on the "Longstay" ward. In the hospital we know that almost all person with stroke has moment of an pushing behavior, almost 90%, but most signs are gone within an day. By the people where the signs are manifest an little group goes to the Rehabilitation center (10%) and the other person will be trained in long care facilities. This article want to give an view, what the possibilities are for this stroke patient to get the best treatment, well pointed on the level of disability.

The person will have an difficult start in the hospital and will have much more time needed to restore for he can make an attempt to recover. But investigation are clear that when they regain their condition that the spontaneous recovery start as well as by all other stroke survivors. Still there are many reason why an patient cannot recover and that is something different as not capable to learn or re-learn or take part in an treatment. Most often the condition is so poor that there is no energy for more than only survive.

On the moment that the condition is better, every patient can learn but now it is dependent of the therapy that must be on the right level and the good motoric learning method. That ask for an good understanding, what the "pusher syndrome "is and what is important to change before the person can take part in an common rehabilitation program. Famous physical therapist out the N.D.T. –Bobath concept have developed an approach that has convince many physical therapist and is done all over the world. Her work is that she discovered the person with the Pusher syndrome and give its place but also created an treatment for this persons with an severe stroke. And even with severe Pusher it works, when this person has the physical capacity to exercise. In this article the person with an severe stroke stand central, but the person with moderate signs will be easier to do. So it is obvious that working with severe disable people makes working with moderate affected people will have less "problems" to do the exercise and get this people on higher level. **Authorship credit** : *"Criteria authorship scientific article" has been used "Equal Contribution" (EC).***Citation.** *Jan van de Rakt , Steve McCarthy-Grunwald;* The "Pusher " syndrome, assessment and treatment. Part 1 - *Ita. J. Sports Reh. Po. 2021; 8 (18); 3; 3;* 1904- 1934 *; DOI: 10.17385/ItaJSRP.21.18.080303; ISSN 2385-1988 [online] ; IBSN 007-11119-55; CGI J OAJI 0,101)]. Published online.*

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Keywords: *Stroke , diagonals , pusher, perception of the spine , midline- perception.*

Introduction.

The person with an stroke that we discuss in this article-series is called the "pusher" and about 12.5 % [1] of all stroke survivors has this syndrome. But the appearance and thus the familiarity with this syndrome is also dependent on the place you work in the Stroke –chain. When you work in in the hospital, were you see the person immediately after his stroke you recognized the picture direct because 90% of the patient pushed [2]! But an lot of then push only one time and then the brain has an solution how to create an stable situation. But when you work in an rehabilitation centre the appearance of an person with the pusher- syndrome will be an lot lesser because this patient stay long in the hospital because the recovery goes slow or this patient will transfer to an nursing home.
In the rehabilitation centre only 10% of the person after an stroke push ands that are the persons that often after the rehabilitation not goes to their home but to an nursing home because they are not capable to recover so fast that living at home with care is too heavy. " So fast" is mostly after an year or less and that isn't possible in many rehabilitation centre. That makes that the pusher syndrome has an negative image and also in the nursing homes this is the group that has no good future and that is not always true [3,5]! This group is in nursing homes about 30%[2,4] but also the group were many therapist gives an negative prognostic label with all consequent[5].
Research has shown that there is an group of persons that start with the recovery after 6 months but regrettably the whole Dutch culture is focus on the first 3 to 6 months[5] thus what happens after that period isn't interesting for the science thus …. no evidence !!!
On the other side there is an lot of investigation about why this person do so and that makes it for therapist possible to get on with an treatment and the treatment of this person is one of our (therapist) major concerts !!
But we must learn from one of the greatest Physical therapists and senior N.D.T.- Bobath teachers Pat Davies[1] from Suisse and Bobath- teacher Jacques van der Meer senior[6] from the Netherlands to see what is the pushing phenome and understand that this need more time to recover.
Pat Davies was the first to recognized that there was an group of persons after an stroke that react differently than the others.
Her book from 1985 was the first book that had an chapter about this syndrome and … ……. an treatment !
And still today this base of the treatment is the same because to create an basis on which the treatment can build up, is to start with the back splint is essential. This and the main symptoms, she first describe are still today very important to start an treatment and to believe in an good result . Because when we give this person an treatment over an long period the result is almost every time amazing.

Start of the recovery .

There is now growing evidence that the recovery start is delayed by this group of patients[3]. That can be an conditional problem but the adaptation of the brain is often far slower than people that had an stroke and no pushing phenome.
When it is an conditional problem, than the recovery can go very slow and it is possible that the body isn't capable to restore but there can also an problem that braced that restoration.
There is now growing evidence that stroke patient has more change to get problems with breathing during the night , the OSAS phenome - Obstructive Sleep Apneu Syndrome-[7] .

This can be present by all stroke patient. An investigation from rehabilitation centre “Heliomare” in the Netherlands has published that 30-80% of the person with an stroke patient can have this problem[8]. Persons with an severe stroke will have an greater risk because the stomach wall is not capable in pushing back the diaphragm in the correct position. That explain also the great risk for persons with an stroke have to get an pneumonia .

The person with stroke with the pusher syndrome and especially the severe cases with the pusher syndrome will have also great difficulty to create an base in which he feel safe. That means that this person will create an attitude with extreme tone and fixation of the not-affected side and have often an low tone on the affected side.

That create an very bad position to breath, but also because the mouth/larynx [9] isn’t functioning optimal and the loss of the stomach tone on the affected side will create an situation in which an OSAS syndrome can occur.

Further is there often an great restlessness because this person are searching for the body perception[10,11]. An person with the pusher syndrome give us this answer, when I asked him why he was moving in his bed always. He explain me that he was searching to the missing part of his body but that he cannot find him.

He search for his not-affected side.

He had the feeling that he will fall out the bed or the chair otherwise and therefore he need to find the affected side but there was no side of his body on the not-affected side.

Oliver Sacks [12] gives an example of another person after an stroke, that fall out his bed, because he move his affected leg out the bed and then he fall. He has the feeling that there were three legs in the bed and one of this legs was not from him.

This searching for their body, this restlessness gives this people at night an very bad sleep and no rest. With the OSAS syndrome this decreased sleep gives an further restriction in recovery and this people are tired after an night and have great problem to stay awake in the day and are not capable to exercise or to eat etcetera.

Therefore it is very important, that the presence of OSAS is known and that it will treat well.

Stabilization

Further one there must be help for this person to “find” his body and created an stable attitude starting in bed because than there will be an relaxation and has the person the possibility to recovery physical from the stroke.

There will be always persons that has not the power to recovery physical but an very important issue is to discover what the reason is of this delayed recovery. And there is an good attitude in bed and the knowledge or an OSAS is present essential.

There are many reason why the recovery not continued and one of this reason can be homesick and see we dramatic changes when this person is in his own environment.

Important is that the search why the recovery isn’t going on and what and what there can be done

to stimulated it when it is possible. That was also one of the first remarks of P. Davies [1] , that this persons had an very bad prognostic because they were not learnable. But the mistake that therapist make is that the level that was ask of this persons was not the right level and then is learning impossible . Especially explicit methods of motoric learning will never succeed because the person cannot do two things at the same time.

And the search WHY this person created this behavior and attitude must be priority number one , when there is understanding why this person created this attitude than the treatment will be possible.

Why pushing behavior.

In the world there are an number of people how has try to explain why this group of patient react at this way.

Karnath[13,14,15,16] , Prosiegel [17], but also Pontelli [18] have given us explanations and the most clear explanation is that in the brain the system that created our midline is damaged. Prof. Luciano Fassoti [11] say that this is an form of an extreme personnel neglect around the spine . And that means that the innervation of the diagonals[19,20] is no longer from two side (90%-10% or on an lower level 60%-40%) but that only one side go to the brain and give the brain the instruction to create this attitude.
This gives us the possibility to create an treatment because the knowledge is there that the other part is present but not aware in the brain, thus must we create an situation that this information enter the brain and created an right body scheme of perception[4].

Photo 1

Photo 1
What is the key of this success in this attitude. This person with an pusher-syndrome created an strong tone on the not-affected side and then he search for stability of his body, he rotated even his head all away to the end of the not-affected side.
Address him on the affected side and you will get no contact with him.
Contact was only possible when you stand on the not-affected side.
Why he is now capable to look at the photograph with the head slightly turns to the affected side and with an smile ?
Because he is no longer afraid!
This isn't an effect that instantly is there, this cost weeks and is only possible with an good multidisciplinary team That knows what and how to do!!
*Photo 1 pub*lished with the responsibility and permission of the author by j.v.d.Rakt.)

Attitude.
The gentleman came at the nursing home after an stay of 4 months in the hospital. His recovery was very slow and the attitude, that he had in the hospital was not changed. He had an extension in his unaffected leg and an flexion synergy in his affected leg.
In the hospital there was as an precaution intervention to prevent high tone in the hamstrings through too much flexion with exorotation in hip, through an pillow between the bed rest and the affected leg and that has make (passive) full extension in the affected leg still possible. Also was there almost no loss of mobility in the affected hip.
Before the stroke he has an little loss of mobility in the hip, but this was also the same as previous and no hypermobility [21] was present now, also no pain in that area.
Movements in the not-affected leg give an movement in the affected leg and always contra the movement of the not-affected leg [22].
That means there was an cross extension-flexion reaction (static reaction)

The trunk was short on the not-affected (latero flexion) and the muscle tone of the back muscle on that side was very high, that of the stomach muscle was normal (not-affected side) – low (affected side). The umbilicus stand out of the mid to the not-affected side. His ribcage was on the affected side "hard", little movement was possible with an pressure on this ribcage
The head was rotated to the not-affected side and that rotation was complete till the end [22].
The head was turn complete to the not-affected and that has influence on the tongue bone and therefore he was feed with an P.E.G. probe. The tongue bone stand out of the mid and was very difficult to relax and make swallowing/eating possible [29]
Great number of cognitive difficulties were present, this we describe this later one.
His perception of the affected side was very poor, normally he felt nothing on his affected side, but when the affected leg was not well supported he give an reaction that his not affected leg was hurt and that pain reaction was disappear when the affected leg was well supported[1,6].
The focus of this man was complete on his not-affected side, he moves very little and was very afraid in bed and especially at night and when the nurse came to wash and cloth him.
At night he was very restless and he had symptoms of OSAS.

Restoration of an "Normal" attitude in supine position.

The first attempt to make lying in bed easy for him was to give him an anti-pressure sore matrass and place the bed with the not-affected side against the wall at night. At night there was always some light that started on the not-affected side and walk over the wall and the sealing to the affected side.
The anti-pressure matrass was set on an higher level to get an firm base. That means that the pressure was changing but the pressure in total was high to get an stable base in his perception and reducing the fear of falling out of the bed.

Photo 2

Photo 2
The placing of the bed with the not-affected side against the wall. That makes it possible for him to feel the wall and felt more secure because he feel that there was no room for falling. With the lightening we try to get his attention and turn his head more to the affected side.
Photo 2 published with the responsibility and permission of the author by j.v.d.Rakt.)

Al this arrangements were also done in the hospital and had some effects, but the attitude was not very alter in that 4 months. He was less afraid but the attitude and the tone was not very different.
In the arm on the affected side was after 3 days an flexion synergy, that was very severe, but thought the approach with placing the bed and the matrass and the support of the affected leg was that tone somewhat decreased. And was the not-affected leg instead of extreme extension changes in more movement. That created an cross-extension –flexion reaction but the extreme extension had created so high tone in the back diagonal started in the not-affected side that this was the reason that the arm was going in an extreme flexor synergy [24].
Contact on the affected side was not possible. When his family visited him we change the position of the bed to get the best contact that was possible.

One year early there was an person with the same symptoms and that person we had placed in an orthosis to created more stability and he react very well. This also with an firm matrass, placing of the bed with the not-affected side against the wall and the light chain.
Only an orthosis wasn't enough.

But why react this other person so well on that approach?

Why can help this orthosis to create an better attitude in combination with the firm matrass and the placing of the bed ? What very special was, what he did with the orthosis:

- He push the orthosis an little bit away
- Or he placed his not affected leg on the affected leg and in that position he was able to move his head after some time independent to the affected side over the whole range.

We hypothesized that the increase stability with the possibility to create more dynamic stimuli give him more information about the affected side of his body and that he feel his body more complete [25,26]. Movement is that essential and that can be done by the changing matrass but also trough the person himself by pushing with his legs or place the not-affected leg on the affected leg.

Photo 3

Photo 3
The person with the pusher syndrome lying in an orthosis and turned his head to the affected side. The bed attitude was good and the problems at night were gone.
Photo 3 published with the responsibility and permission of the author by j.v.d.Rakt.

Our conclusion was that this orthosis has together with the other interventions an great effect but not clear was how to obtain this effect on an faster way and or this orthosis was qua construction optimal. We choose for this type of orthosis because we were afraid for pressure scores. This result by the person of photo 3 had success after 3 months but that are 3 long months were many night nurse had much work to lie the orthosis on the right spot. But and that was very important there was an difference, not the person was calling for the nurse but the nurse goes often to the person to correct when necessary. The person was sleeping much better almost from night one and that was the most fascinating effect for everyone in the team.

By the person on photo 1 we want to know what the best way is to handle this attitude problem and create an situation with dynamic stimuli that give maybe an faster reaction. This investigation started with placing dynamic stimuli on three different parts of the body and see what the reaction was on that.

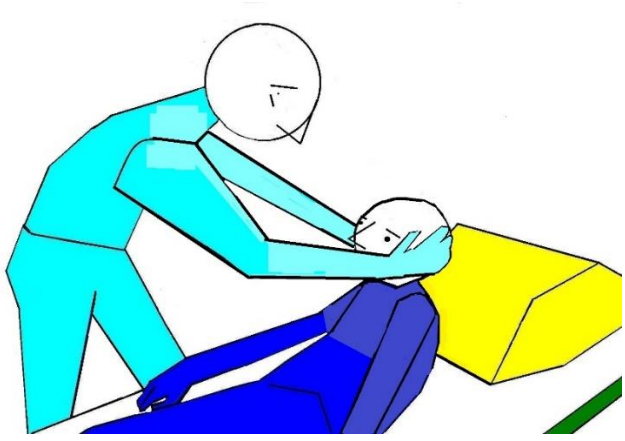
The investigation.

Three kinds of dynamic stimuli were given separately on different part of the body and that were proprioceptive stimuli. Extra noise or spoken stimuli were given through the great cooperation of his family especially his wife. Together we were capable to get his attention, when his head was rotated to the affected side.

Visual stimuli, here there was an creation of different colors and light flash that must draw his attention (Photo 2)

The proprioceptive stimuli was an combination of tactile, proprioceptive on the joint (approximation [29] and the dynamic extero- cepitive stimuli through light and sound. The part of tactile etc. was the part of the physical therapist and he give on both side pressure [30,31,32] to let him feel where he was going and with direct adaptation when he react on movement to the affected side and increase that movement, further the approach start with the head, than the upper trunk /head and the last one was the lower trunk/legs and when possible with an movement of the head, this scheme according the trunk- classification [33].

1. The pressure on the head was perform (picture 1) on both side of the head and always starting with 1 minute without any movement and with an varied pressure. When there was movement possible, the head was rotated to the affected side and when the head passed the midline the other stimuli will be given. Visual with an lamp and auditory through the family they told him story about his past. The moment that the head passed the midline was also the moment that he react on the visual and auditory stimuli. That was remarkable because when his head was total turn to the not-affected side, he was not capable to recognize the voice of his wife and also know nothing about what she was saying and when the head go over the midline this was now possible . There was an visual and auditory neglect when the head was complete turn and fixated to the not-affected side but when the head was over the midline this neglect was firm decreased. The pressure was hold for 5 minutes when the head was to the border of the movement possibility to the affected side with the visual and auditory stimuli. After this 5 minutes the pressure was slowly decreased and finished. And only the visual or the auditory stimuli remain. The best performance was obtain with visual and auditory stimuli than his head stay on the affected side for 5 minutes and then the head turn back and was the situation were the situation when we started.



Picture 1

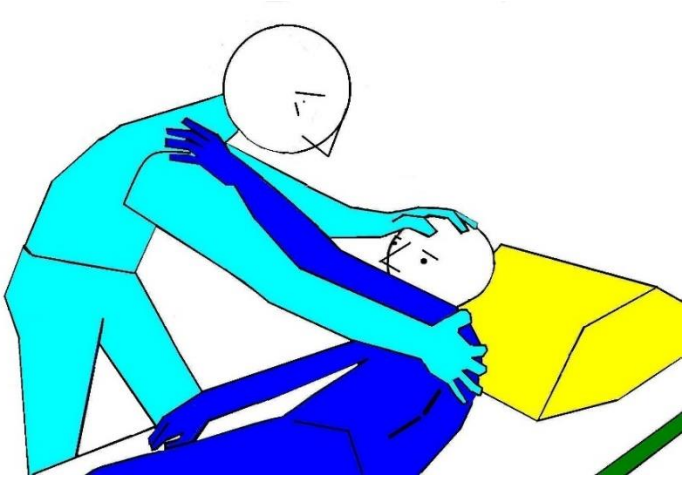
With two hands on both side of the face. They give the dynamic pressure and when the tone decreased, the movement to the affected side was performed. And the pressure stay dynamic the whole time.

Picture 1 published with the responsibility and permission of the author by j.v.d.Rakt.

Picture 1

2. The second attempt was performed by giving pressure on the head and the not affected shoulder/arm. Again with variation of pressure and movement occur after 1 minute to get the patient costumed on the pressure and touch. The pressure on the not affected side was giving in the direction of the affected side and receive an increase pressure form the matrass that was so hard as possible. That was done with every test. The

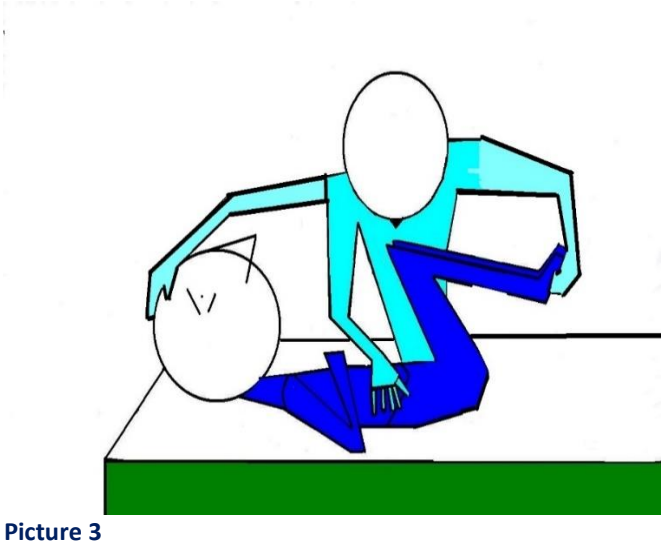
performance was the same as with head. There was given for 5 minutes pressure with the all stimuli and after 5 minutes only the other stimuli (visual and auditory) go on. The reaction was the same after 5 minutes after the pressure the person start to return to the start attitude and was the "neglect" for stimuli on the affected side again positive.



Picture 2

Picture 2
Pressure on the head had now the direction to the neck (approximation [29] and always the first minute no movement but pressure variation.
When the tone decrease after that minute that the movement to the affected side start and continue with the pressure when possible.
Picture 2 published with the responsibility and permission of the

3. The third attempt was done with the legs/lower trunk and in the first attempt with pressure axial on the head but later on starting with pressure on the ribcage of the not-affected side together with the legs/lower trunk and the pressure on the head when movement was possible. The procedure was the same, starting with 1 minute pressure with variation and no movement and then turn to the affected side when the tone decreased. Where the legs and the head over the midline the visual and auditory stimuli were performed and the pressure was performed for 5 minutes. Than the pressure was decreased and finished and only the visual and auditory stimuli remains.



Picture 3

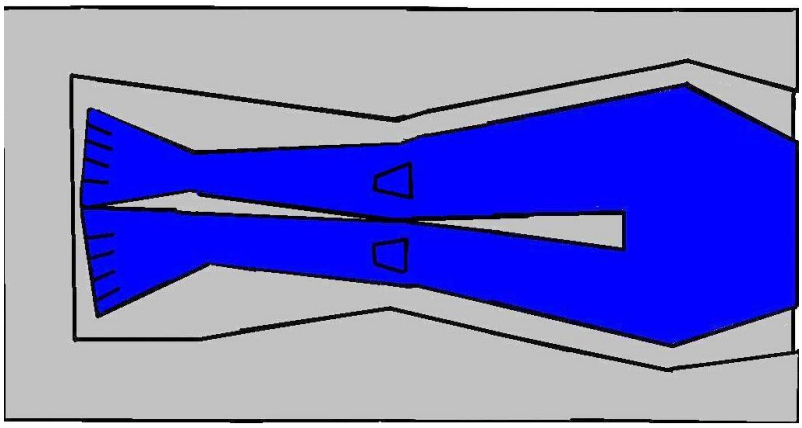
Picture 3.
This man has no "three arms" but this is the start position. One hand on the stomach and the legs with also pressure from the therapist with his stomach. When there was movement the hand on the stomach goes to the head and gives axial (approximation) pressure. The hand on the feet gives pressure in the direction of the knee (also approximation with variation of intensity)
Picture 3 published with the responsibility and permission of the author by j.v.d.Rakt.)

Now something remarkable happen. He stay focus on the affected side for 15 minutes without someone touching his head or feet, only the auditory and visual stimuli were present. After 15 minutes the movement goes back but on later attempt was touching the feet with pressure to the stomach enough to get him "back".

This was the answer Why the person on photo 2 react on the orthosis and now we could make an orthosis that gives more pressure under the feet. But we know that this had cost 3 months and we want to get an good attitude without high tone, faster.
The photo 1 show an moment in the daytime that the orthosis did his job. What we see is that his not-affected hand is behind his head but he was capable to move his arm all directions and not hold any longer the edge of the bed.
This was not the case at night, therefore the orthosis must be capable to give more pressure (information), because we had seen that when there was giving pressure on the feet the reaction to turn back immediately decreased and the neglect for and to the affected was much lesser.
The orthosis was alter so that both feet get more pressure and the most under the affected foot , that was better but the best solution the patient give us. He put his not-affected leg on the affected leg (dynamic stimuli [26,34] and now this attitude gave also at night an better tone and the sleep problems where decreasing and after 1 month his capability to eat was so much improved that the P.E.G. probe wasn't used anymore.

We alter the orthosis and allow the legs to touch each other and that increased the effect of the pressure given by the not-affected leg on the affected leg and there were more variation possible.
That means that the orthosis on photo 1 must be alter on two points:

1. The part between the legs must be removed, allowing the legs to inform/ touch each other. That was very important because now the cross extension- flexion reaction was gone and also the danger of creating an pressure score on the affected foot through the movement of the foot against the wall of the orthosis. And he can inform his affected leg with his not- affected leg on different ways and had no obstruction through the mid piece.
2. The orthosis must be given an higher pressure and that was obtain by making the orthosis higher. Now the legs were bend more than necessary and created an push-away reaction. This was in the night often the best way to improve the dynamic stimuli when he was awake and restless. To place the orthosis more against the feet, he start with an pushing away movement and that give within an few minutes by him an decrease of tone restlessness and better sleep. When he was asleep the nurse pull the orthosis an little from the feet and that create than more rest.

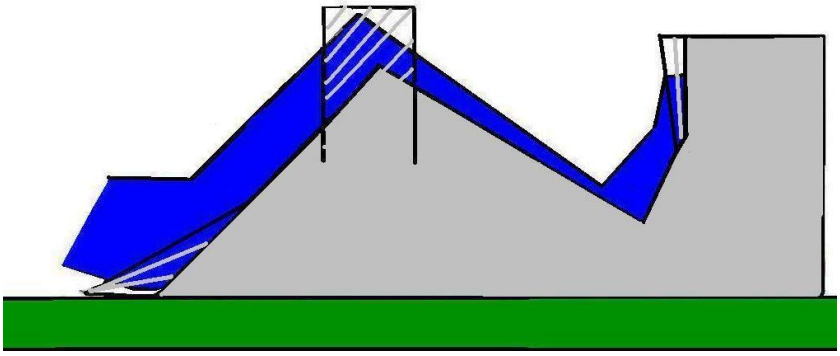


Picture 4

Picture 4.
An orthosis without the mid-piece allowing the leg to inform each other. Now it is for him but also for others, very easy to put the not-affected leg in top of the affected leg with all good effects.
Picture 4 published with the responsibility and permission of the author by j.v.d.Rakt.

This orthosis is big and that informed not only the feet, but also the legs on the inside and the outside and the back area of the buttock. Of course not everyone had need of so much information to come to an reaction.
But when we build an push –away orthosis there must be an stimulus that evoke that stretching of the affected leg and that is dependent of the angle in which the legs are bending and the possibility that there is an extension possible.

That evoke an push-away reaction and that can the therapist assessed by bending the legs so far till this reaction is there.



Picture 5

Picture 5.
Push-away orthosis in which also are places were the pressure can be increased. Here the flexion in hip and knee are huge but then the extension occur!
Picture 5 published with the responsibility and permission of the author by j.v.d.Rakt.)

Very important , an push-away orthosis can never lie in this (Push-away)- stand for longer than one hour or the patient must do it himself. That means that he start and stop with extension in the legs and get his rest moments otherwise this can lead to an increase of restlessness and exhaustion. This we think through an extinction[36] and after that an information that has an negative impact.

The OSAS was treated with oxygen and he show an better condition. There was now an better attitude and the first restoration of the diagonals on the back and the front. Lifting the head was now possible with an slight deviation to the not-affected side.
The orthosis with the position of the bed against the wall, the firm matrass and the light snake from the not-affected side to the on the sailing was the answer to create an attitude in bed in which he had no extra effort needed to felt stable.
But when the A.D.L. was performed al elements of the pusher were there and with the neglect of the affected side. He was afraid for the A.D.L. (Active Daily Live) therefore there was created an combination of A.D.L. and physical therapy. The therapist make the turns necessary in bed with high and alter pressure and created so an stable environment in which he felt stable and the nurse can do their job. And the A.D.L was more an P.D.L (Passive Daily Live) [37] with even the clothes are adjust to get this done easy and without too much cost for him
Other bed attitude were almost not possible and that part was the first exercise in the morning to create an attitude on the not affected side and at the end on the affected side. Especially on the affected side was very difficult and cost an long period to create an stable attitude.[38,39]
But lying on that side will give an lot of information that put his attention on this side and some scientist see here an big item for therapy (L.A.T. – Limb Activation Therapy) [40]

Movement exercise in bed was not the next goal.

The next goal was sitting in an wheelchair and after that standing and walking. That means that attitude restoration had the first priority and movement from the one attitude to the other was too difficult and will be treated later on. He was capable to stand with an behind splint, but the transfer [41]in and out the bed was still perform with an passive elevator.

Sitting in an Wheelchair.

The second challenges is to get an attitude that is good in the wheelchair and an attitude in which someone dare to move and can move.
Often is there well an sitting in an wheelchair but the patient is always afraid and especially when someone drive him and that means that the stability of his body isn't right. Remarkable is

that his attitude is often very “nice”, but when you look good, he don’t dare to react on stimuli, because his is afraid to fall.
The next photo is such an example, He sit in the wheelchair but look to the ground and only when same one touch him , there was an reaction.

Photo 4.
Of course this wheelchair isn’t right for this person. But everyone shout, that the wheelchair is to large and that is true but the greatest problem is that this person cannot handle it. We see that he hold the left side of the wheelchair and “push” his body to the other side together with his not-affected leg. That create an pressure on the affected buttock, who has an low tone and therefore he sit on the bone of the tuber ischii and that will be hurt . But he dare not to change his attitude. He don’t makes contact with his environment ,
his is afraid !
The amount of tone in the legs is very different . On the not-affected side high, but very low on the affected side. Left is round and right is flat.
Photo 4 published with the responsibility and permission of the author by j.v.d.Rakt.

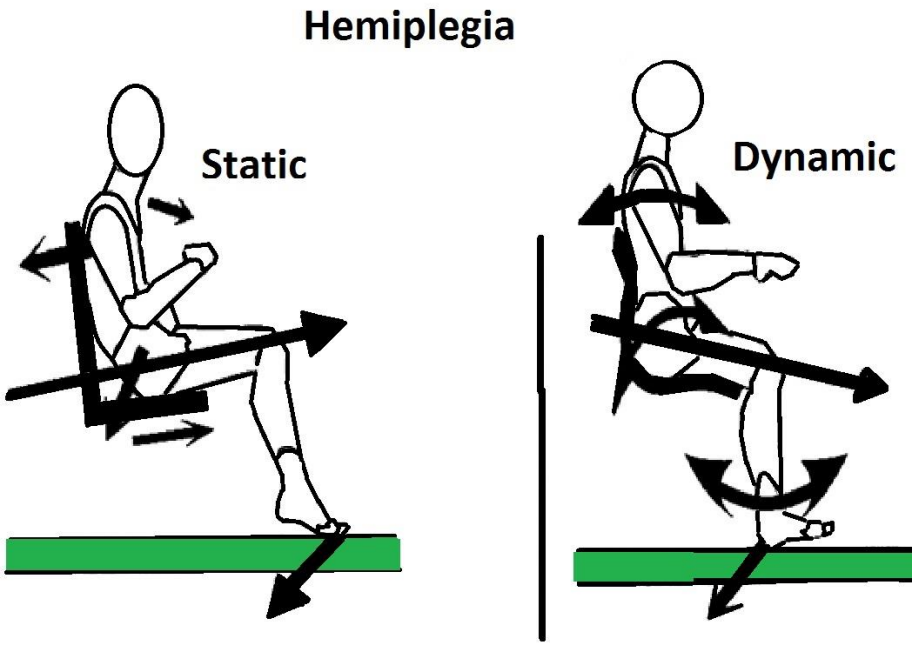
Photo 4

The tone of the affected side in his arm is high and that give us the presumption that he is pushing with his not-affected leg because now the back diagonal from the not-affected leg has influence on the affected shoulder. And now we see something special, we see often by “pusher-Patients”, activity in the distal parts hand/elbow , foot and knee and lesser activity in the hip/shoulder and trunk and fixating activity in the neck.
Often there is active function in the hand and foot, but that demised through no use and/or thickness of the hand /wrist.
This wheelchair don’t give the perception of stability and that stimulated him to search for that stability by using the not-affected side complete and make an end-point in hand and foot and make the whole not-affected side stable with an high contraction. This will focus his attention complete to the not-affected side and there is no room for making contact with the affected side. He is performance on the T.C.T. Trunk Control Test [44] was on 3 items 12 points, but sitting on the edge of the bed with one people on the affected side, was 25 point (more than 30 seconds alone) , but only possible with one person on the affected side. Without that person, the attention[45,46] goes directly to the not-affected side and he pushed.

The wheelchair must therefore give stability but also there must be an possibility that the patient moves in that wheelchair because otherwise the stimuli will extinct[47] and the patient will try to find an solution by pushing on an higher level.

Important issues for creation an wheelchair for individual with an pusher syndrome especially the severe ones.

1. Rear but essential is that the wheelchair is not low. Propelling himself with the wheelchair isn't important ,often is the person not capable to do so but every form of standing procedures isn't not possible because the chair is too low. Especially by severe "pusher –patient " (but also by the others) the standing exercise must be done with an back splint (an invention of P.Davies [1]) and then is an higher chair essential. The hip joint must stand higher than the knee when the feet are on the ground. This person will go faster stand than move or do transfers in and out bed and therefore must the wheelchair give an contribution.
2. The most important part is the sit cushion, not only the height but also the form and the position in which this part of the wheel-chair stand. This is the work of Bengt Ëngstrom[48,49] and he search for an pelvis stand that had rotated to the front and created an extension in the lumbar spine. He make that happen by the "fixation" of the pelvis in the seating area with an support back on sacral height and not by pushing the lumbar spine in an extension. That is an great difference that often isn't see in wheelchair – land. When the form is right than mostly the stand of the sit part can we alter (on the front lower than on the back) and that give more extension lumbar and more possibilities to move with the upper trunk. There is an stabilization of the lower trunk and now the diagonals are capable to work and become active.

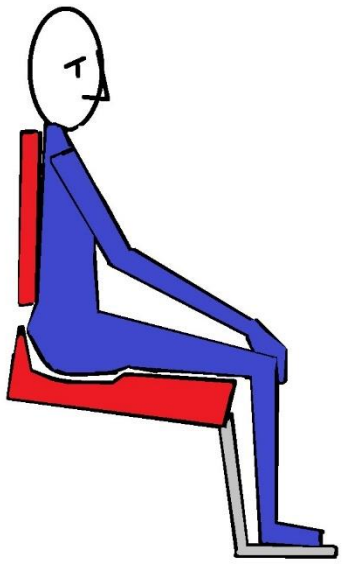


Picture 5

Picture 5 gives on the left an attitude that is moistly see by stroke patient and especially the pusher patient and what we want to achieve, see on the right. In an wheelchair it is not wise to make an sit part together with the support part on the back, because the procedure and the possibilities to get an patient good back in the wheelchair isn't than so easy. And the risk is there that the patient will push against the lumbar support and slide to the front and we get the attitude of the left side of the picture.

Picture 5 published with the responsibility and permission of the author by j.v.d.Rakt.

In the search to get an solution, the sit part was develop with an area in which the buttock was fixated and the push to get the pelvic in the correct position was perform by the end of the sit cushion to the sacral part of the spine/pelvis.
Then there was an area that was free and came the back support and there it must be able to correct this position. In picture 6 this is exaggerated to give an picture what is important to achieve an fixated pelvic.



Picture 6
The hole for the buttock start on the end of the trochanter major distal. On this way we can measure this on the side of the upper leg and can the patient be seated.
There we go 2-3 cm. down and hold that till the end of the buttock and then we go up about 5-9 cm and end in an point. This because there is than space to move with the buttock.
The back support stand in this picture very compact against the spine that is often not possible therefore be sure that this can be changes.
Picture 6 published with the responsibility and permission of the author by j.v.d.Rakt.)

Picture 6

To get also an optimal perceptual stabilization, it is important that the feet are support well and often it is wise to place the foot support an little higher than normal on both side with the exception when someone push with his not-affected foot and that give an cross extension-flexion reaction.
What also is possible in this chair is, that the front of the sit cushion can be lower than the back. In the beginning will often be horizontal but the best stand is some degrees on the front lower. That gives more extension in de lumbar spine and makes the movement from sit to stand more effortless. Often the space between the side support and the outside of the legs must be filled up to created more fixation but that has his biggest value when the person moves in his chair with his trunk. That can be done by placing him for an table or by give him an support on the wheelchair. This is not the same but when there is nothing in front of him he will not dare to move to the front and therefore make no movement.
The individual with the pusher-syndrome will always had more “body” on the affected side than on the not-affected side, he is afraid to move too much to his not-affected side because he feel that he is falling and therefore is too much correction useless.
But that will give complains about his buttock on the affected side because the tone is there often so low that he sit on his bones and that is painful. The individual with stroke with no pusher syndrome will sit on his not-affected side because he has the capacity to change his body to that side without the feeling of falling.
Often this will be treated with an cushion that created an softer area but that softer area gives also less stability and the person will be push more because the fear of falling will be increased. When this is happen than the only solution is to create an position as show in picture 6 because now the tone of the buttock is higher. And make sit for an not to long comfortable, when this sitting time isn’t too long (maximal 2 hours) and give also room to support to the front and then is an table favorite because the movement is much more to the front than an support on the

wheelchair. Through the great movement to the front the buttock will be free of pressure and the complaint will be gone for some time .When the tone in the buttock is restored, this complains are gone but then this patient can also stand up and walk with support. Be aware that with an wheelchair the movement of the trunk to the front can give and turn of the wheelchair to the front and the person will feel that he is falling out the wheelchair. Always prevent that through the placement of the front wheel to front instead of let standing to the back.
In the past several experiments are conducted to investigated what is possible with this sit cushion and how much function must an person have to sit in this wheelchair with an good attitude and the possibility to move. Furthermore as part of this investigation there was also look to the possibilities of the movement of the head and the swallowing capacity[23].

The lumbar spine in extension makes it possible that the collapse of the thoracic spine is eliminated and that an reaction(too much extension) of the cervical spine isn't necessary any more. When the lumbar spine is in an flexion position than the thoracic spine will collapse to the front and that can only be corrected by an extension cervical and that created an antero-position of the head [42] with an stretch on the front muscles of the neck and had an negative influence on the swallowing possibilities. And by the Pusher patient there is often an asymmetric of the neck muscle and that will change the place of the tongue bone and makes the swallowing process even more difficult . Therefore is it very important that the cervical spine is free to move and stand good. Never underestimated that border because than is sitting an disaster !!

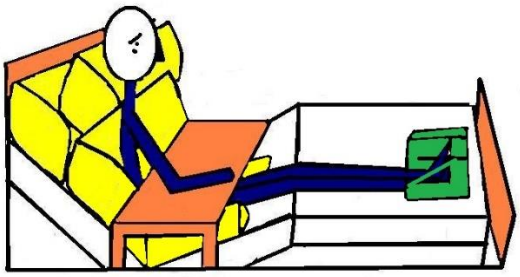
An Example

Example in which we can see what the influence is on the front of the neck when the head attitude isn't right.

Photo 5

Photo 5
His gentleman "push " with his head against the back support and makes an high tone in the cervical spine. That result in an stretch on the front muscle and that pull his mouth open.
When he try to eat in this chair it was impossible because the tone in the cervical spine don't allow him to get an relaxation. Only in bed in an good sitting posture there was an relaxation of the cervical extension and was eating possible. Photo 5 published with the responsibility and

The performance of this man in bed was very poor .
Trunk Control Test was only 12 points.
Meaning that he was not capable to turn in bed to both side and was not capable to come to sit on the edge of the bed without much help. Sitting on the edge was only possible with support, occasionally he can sit on his own for an few second . That means that this wheelchair give him not the support that he needed and that an bed attitude with much support was much better and take care that his "Feeling" of falling was disappear.



Picture 8

Picture 8.
The bed attitude was created with pillows in the back and on the side of the body an small orthosis for both feet [41]. That create an attitude in which he could lower his tone of the cervical spine an dare to move and could reasonable normal swallow.
Picture 8 published with the responsibility and permission of the author by j.v.d.Rakt.

Searching for an wheelchair that could imitated this was very difficult and was at the end an wheelchair that look like an bed. With an lot of support on the whole trunk and legs and that create an attitude that it was possible that he can move his head. But he managed to sit in this chair about an hour and then he started to push his head to the back.
Changing the sit cushion in to the design of picture 6 and leaving the stand of the chair more to the back with the support pillows had no influence on his capacity. That means that an patient with no capacity to move on his own or with little help, will not sit very well in that sit cushion and therefore the correction of the lumbar spine has no extra value.

Photo 6

Photo 6
Here an person after an stroke and with the pusher syndrome, sitting in an wheelchair that has that special sit cushion. And in this case the foot support is gone and the support in front of her is also removed.
Still the thoracic spine is not collapsing and the head is free to move and no tension is build up in the cervical spine.
That she don't like this situation, is visible by the grasp of their not-affected hand on the wheelchair support on the not-affected side. Still the attitude is good and with the support on an table without fear.
Photo 6 published with the responsibility and permission of the author by j.v.d.Rakt.

This chair standing horizontal but the photo gives the view that this isn't true. But when we make an photo of the chair an cushion without the patient (photo 7) than we have an better look.
This person has an T.C.T.[44] (Trunk Control Test) of maximal 48 but when the amount of help needed to make movement than there is reason to give here 12 points. But the possibility to help with the movements was much greater than the patient on photo 4 and 5 and she can sit free without support on the edge of the bed for 10-15 seconds.
She managed to sit 2-3 hours in the morning and midday but she must than have always an support in front of her to lean forward to get the pressure of their buttock .

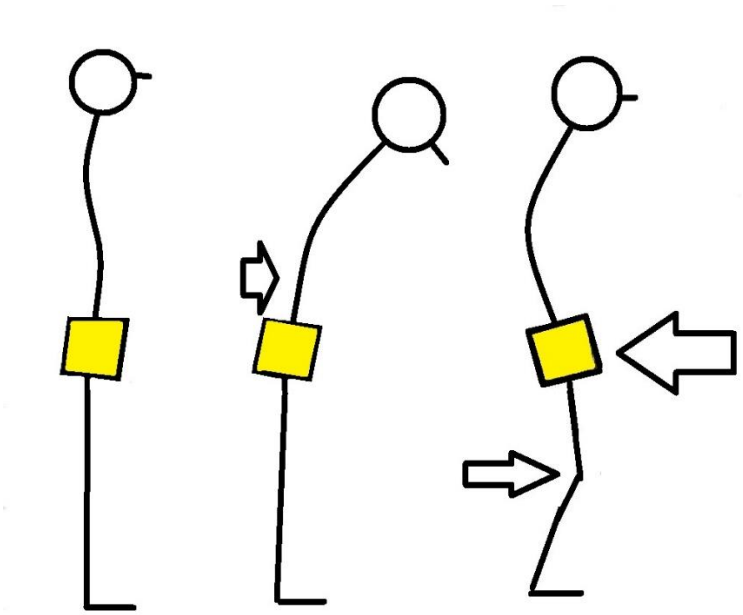
Photo 7

Now the design of the sit cushion is better to see and now it is clear that the cushion stand slightly on the front lower than on the back.
On the left side there is the possibility to rest the paretic arm together with an support in front of here.
But behind an table that the arm-support was removed to give her the opportunity to lean to the front and release the pressure of the buttock.
From the first moment she dare in front of table to reach and grasp things from the table. Somethings that the sir on photo 4 dare not.
Photo 7 published with the responsibility and permission of the author by j.v.d.Rakt.

The sit attitude with this cushion ask for some mobility but through the design of the cushion, the pelvis is fixated and there is more possibility to move the upper body to the front and therefore this design is suitable for more patients that sit in an wheelchair. Furthermore this design makes standing up out the wheelchair easy in comparison with wheelchair with not such sit cushion design and were the front is often higher than the back. With the front higher there is also an fixation but to come out the wheelchair the person must -"climb on an hill".
There is one exception !!

Exception !! Lumbar Stenosis

Person with an lumbar stenosis will have great problems sitting in this sit cushion because of the fixation of the pelvis and the extension of the lumbar spine. Extension in the lumbar spine makes the passage of the spinal cord less and that can evokes serious complaints. The only possibility is to make more flexion in the lumbar spine to create more space in the lumbar spine passage.
This must be done but will give by the sever pusher-patient an lack on information and will give faster the reaction that they go to push with the not-affected side (arm and Leg) to the affected side with all problems.
This must be clear and try all fixation you know but be honest that the sitting time and comfort isn't so good and that the time of sitting is restricted.
This asked for an good team that knows what is possible for that person and how to manage when the tone trough the pushing is increasing.
And often is that – back to bed with the proper measures.



Picture 9.
The attitude that the patient with an lumbar stenosis will make to get the lumbar spine in to an flexion position . Normal (A) with the lumbar spine in extension. Now the balance between the front and back diagonal is good en together the take care of the perfect pelvis posture. Flexion Lumbar (B) means that this person has an eccentric contraction of the back diagonals and less contribution of the front diagonals . Shifting the pelvis to the back (C) gives an flexion lumbar but also an flexion hip and knee.
Picture 9 published with the responsibility and permission of the author by j.v.d.Rakt.)

Picture 9

Both postures will change the optimal diagonal cooperation. B will give more eccentric activity of the back diagonals and less power of the front, but C will ask for an “release” for the back diagonals and more activity from the buttock muscle and stomach muscle to hold the pelvis in this position. This are both not “postural”- (“Red” muscle with an good circulation) muscles and that means that this posture is difficult to hold for an long time. Mostly will at the end an posture develop that has both components and the action to shift the pelvis will be done by the hamstrings and adductor muscles. That created an attitude in which the back diagonals have not the right angle and the front diagonals are weakening. Because the angle has not the right degree, this will harm the power of the homolateral structure (muscle gluteus medius) and together the balance power in the lower trunk is decreasing.

Symptoms of lumbar stenosis are [50]:
44-49% between the age of 60-70 years.

1. No pain when the person sit, but he/she sit with lower trunk backward.
2. Unexplained urinary inconvenience.
3. The pain will decreased when the person makes more flexion in the lumbar spine .
4. Bilateral gluteal pain in both legs.
5. Neurological claudication.
6. A walking pattern with the legs wide. (abduction, exorotation and flexion hip and knee).
7. Deviating Romberg sign.

This symptoms are not yet radiographic significant.
Lumbar stenosis together with an stroke will give an problem. The extension of the lumbar spine cause pain and often by the pusher syndrome this extension with an high tone on the not-affected side will cause pain in the not-affected leg. Standing must then be done with more flexion in the lumbar spine and the best solution is to start with an larger upper trunk forward with support on the front. Sitting in an wheelchair with an “orthosis” to hold the pelvis in an Fixed position to the front isn’t possible because this will give an lot of pain. Now the pelvis must rotated to an lower trunk backward and it is than important to make the chair of the correct

high to make standing up possible and give in the lumbar area enough space to make an movement of the pelvis to the back.
Impression what an lumbar stenosis askes from someone, see in photo 9-12 and this person has no stroke !

Lumbar stenosis, how to sit , standing up and walk?

Photo 9 **Photo 10** **Photo 11** **Photo 12**

Photo 9,10,11,12. *Often will long- time sitting end in an lower trunk backward and because he isn't capable to make an extension in his lumbar spine, standing up is than very difficult. With his weight on his hands, he must correct the placement of the feet. And then he must create an balance situation so that he is capable to grasp the rollator frame. His walking pattern shows both side exorotation and the most on the left side. Important is that the rollator frame give him the possibility to walk with flexion in his lumbar spine because otherwise he will have pain. Photo 9,10,11 and 12 published with the responsibility and permission of the author by j.v.d.Rakt.*

Standing up will for this person better possible with an upper trunk forward. And that is possible through an supporting area in front of him. An table will give him the opportunity to make an upper trunk to the front and he can pull on his hand will the elbow on the table and of course from an chair that has enough height.

Photo 13

Photo 13
Capable to stand up by herself through an upper trunk forward and pulling with the hand with the elbow supporting on the table[39].
This is the way that the man (photo 12) with an lumbar stenosis must stand up but with an chair that is higher !!
First rule to get up for older people and certainly disable older people is that the height of the chair(Wheelchair) is high enough. That means that the hip stand higher than the knee. To the support on the table with the elbow has the person the possibility to pull on the edge of the table and then we see an upper trunk forward movement that makes standing up easier and far more stable because of the great stable support area of the table. The balance is there !!
Photo 13 published with the responsibility and permission of the author by j.v.d.Rakt.

Of course there are more exceptions, often is an slight adaptation enough so that person sit well with the lumbar spine as an good base for the rest of the spine and that the head remains mobile. Be careful with soft cushion especially by person with the pusher-syndrome. Soft cushion gives the person less stability and can create an feeling of falling and now the person will not move and certainly not to the front, he will make an anchor see photo 4 and make more power on the not-affected side and therefore with more pushing. Or when it is very problematic an upper trunk backward with an static reaction- photo 5.
And that means that the patient sit in an wheelchair that ask to much of his capacity!!
Too much means no learning and no recovery and the quality of live is very poor !!

Three Attitudes ! The treatment start with control over this attitudes !!

Is the bed attitude often the greatest problem in hospitals and nursing home, the sitting problem occurs also in rehabilitation center. And often is the wheelchair not good and too low to create the third attitude. Standing and especially walking so soon as possible is the **brilliant** work of Pat. Davies and there she has find the key to come to an further rehabilitation and recovery of stroke patients.
Still there are therapist that try to treat this person from the not-affected side and to “convince” the person to release the high tone but no person with an stroke-pusher can do so when the affected side isn’t cooperated.[1]
This approach on the not-affected side will give an struggle between the person with an stroke (pusher) and the therapist. The person will feel very unhappy because the information he need from his body tell him something total different as the therapist want and asked him to do. The person will feel that he cannot hold his balance because his brain tell him something total difference as the reality the therapist sees.
Pat. Davies was the first that say that and has the solution.
Not starting with exercise in and out bed but with standing and walking. Not starting with ADL training before the person has back his right balance because when there is no good balance it is impossible to wash or dress himself. And training on that issue is than wrong !!
I am very grateful that I may use the pictures of P. Davies to explain the approach of P. Davies.

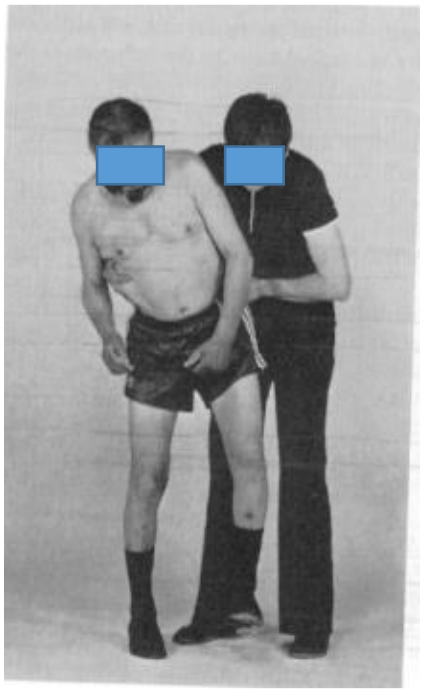


Photo 14

Photo 14.
This photo gives an picture what is happen when we try to place someone with the pusher –syndrome in the right alignment.
An alignment that the therapist sees as the best balance situation but the person with an pusher-syndrome has his own reality and will work opposite.
And that he does with the perception that his damaged brain give. He get the feeling that the therapist push him out balance and he resist through :
- *An full extension of the not-affected leg.*
- *An upper trunk side way but with an full restriction of an lower trunk sideway.*
- *An immense adduction of his not-affected arm in which he pinch the hand of the therapist.*
- *His head is to the floor and he is very angry about this movement to his not-affected side.*
- *On the affected side we see an increase of the tone in the arm and in his leg.*

Photo 14 published with the responsibility and permission of the author by j.v.d.Rakt.

The tone in the arm and leg are signs that he is struggle. And the reaction of his affected leg is an sign that he use an static reaction to counter the correction of the therapist – an cross flex-extension reaction.
This photo is so important because the other method can ended in an struggle with the person. Often we see that person with an severe pusher syndrome go from an rehabilitation center to an nursing home because this person isn't "cooperative" or is incapable to "learn" and when we started with standing an walking according Pat. Davies-approach and do the transfers out bed in the chair with an patient lift, there is an recovery.

P.Davies Approach;

The first exercise in standing was with an back splint on his affected leg standing for an mirror and do something. In this case standing en shaving and the attitude was never without slight movement . Therefore an very dynamic posture that gives the affected side so much information that the affected brain started to react on that information and that you feel that the diagonals comes back.

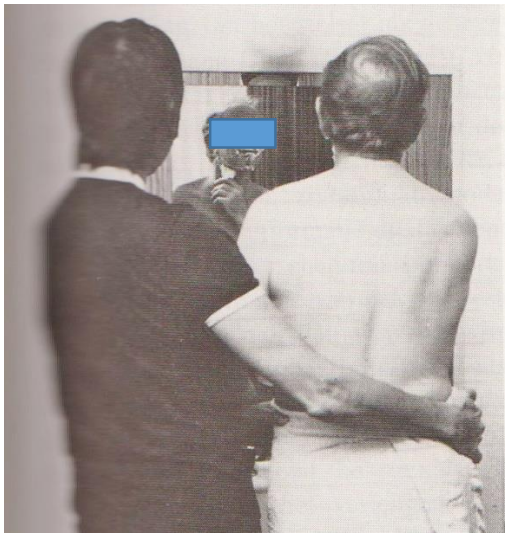


Photo 15

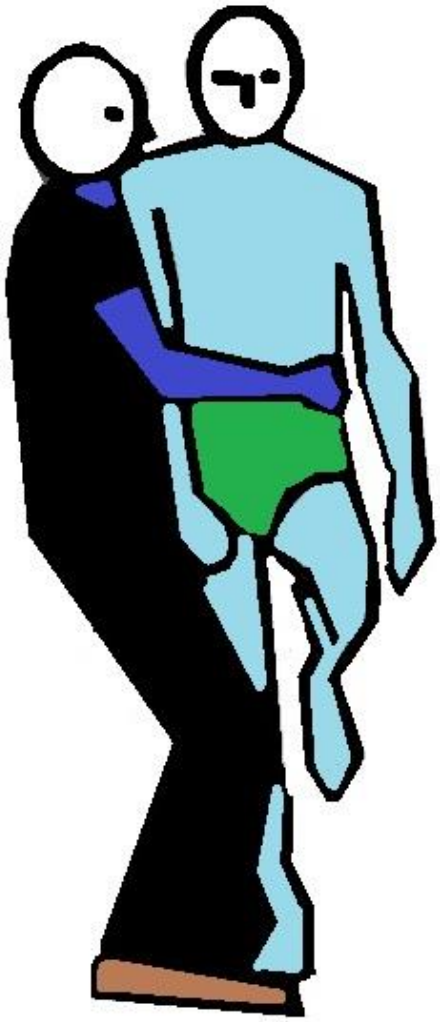
Standing for the mirror and shaving himself. Now the mirror isn't used for attitude control but as an reason to stand. Focus on the goal [51]!!
When patient want to correct there attitude in the mirror that often very difficult but shaving isn't . Therefore brilliant solution to get the standing an purpose- goal ! The attention of the person is focus on shaving and the standing performance isn't the first priority but the brain learned!
Photo 15 published with the responsibility and permission of the author by j.v.d.Rakt.)

Photo 15

This photo are from the past century but (and I am very grateful that Pat. Davies allowing me this) it is so clear that the approach of Pat.Davies was so right and timeless therefore. Her approach is the best way to train and teach patient with the pusher syndrome how to move and restore the possibilities. The photos of the patient with the pusher syndrome are so clear that it is easy to explain what the pusher syndrome is and why her approach is so successful.

Therefore we use this group of photo's to create the best picture what the pusher syndrome is and how to assess and what the approach is.
What is so important is that the person with the pusher syndrome must feel himself safe.
Too often try physical therapist to correct the attitude with his voice of even with an mirror in front of him but often asked the therapist that two things at the same time[52].
That will never succeed and will demotivated the person.
But there are more signs that the demands are too great for this person and that he is not well understood.
This signs are :
Photo 14- the increase tone of the affected arm is an associative reaction that gives an sign that the person is working hard.
But the cross flex-extension reaction is an sign that he works against the border of his capacity and maybe over that border. Than can nobody learn and will everyone stop with this therapy !!

Photo 16



Picture 10

Photo 16 and Picture 10.
On photo 16 we see the same person on the same day as on photo 14!!
Make standing possible and give the affected leg the essential information, by using an back splint (photo 16 left leg –left stroke) or use the "Berengriff "(picture 10) and make standing on the affected leg total possible without the possibility of pushing with the no-affected leg or arm.
This give the information that the brains need to restore the attitude!! And this information must be dynamic [53], because otherwise there is always the danger of extinction[36]. The pusher syndrome is through some investigator called as an extreme personal neglect [11]. This attention deficit must be in the treatment incorporated because otherwise the loss of attention will be have an effect on the information this person received.
Photo 16 and picture 10 published with the responsibility and permission of the author by j.v.d.Rakt.)

Photos of pusher patients[1]

Photo 17

Photo 17

This lady lies on an bench and - look at her face. She is afraid to fall and we see that see hold the bench firmly. When you observe the pattern of here swimsuit, than the not-affected side lies higher and is shortening in comparison with the affected side . The attitude that she create look like an "banana".
Their head lies on an pillow but the tension of the muscle on the front of the head is high, but the head has no cervical flexion, she don't lift the head to look to the person who is taken this photo. Hold the position of the head in your mind and compare this with the head position on other photos of her.
The diagonal on the front and the back start both on the not- affected side and don 't cross over. The tone on the affected side is low in the keypoints and in the arm and leg and high in the not-affected side. This explains: why- the not-affected side why the affected side lies lower!
Photo 17 published with the responsibility and permission of the author by j.v.d.Rakt.

The affected foot lies in exorotation and there is an danger that there will be an pressure score on the Malleolus lateralis and an hypermobility in the affected hip in the exorotation direction and an losing of the endorotator muscles [54].
Movement will occur when she move her not-affected leg and that can evoke an cross extension-reaction in the affected leg. That will be often an flexion, extension movement but no correction of the rotation and this we make the danger for an pressure score greater. This will also the moment that the striker foot [55] on the affected side will occur. That asked for another action to give this foot an end point what can give support and less tone in the calf-muscle or sarcomeres-loss there.
Very important that from the start the exorotation will be avoid and that the movement will take place in an control manner. Transfers in bed, and then in an bigger bed, will be very difficult because every movement will be given here the feeling of falling and she will push with her not-affected side.
Therefore transfer in bed as turning in bed, going up and down and to the side will be answer with pushing. Of course it is important that she learn to move in bed because the ADL must be done but make this an combination of exercise and washing and dressing. In which the therapist will search for an optimal situation in which the patient feel stability and information of his affected side. And hold this for an long time to be an exercise and not an part of the ADL movements.
The transfers in bed will be possible on the end of the rehabilitation and must be train and learn through the whole rehabilitation time and certainly not on the start because the possibilities are than to poor.

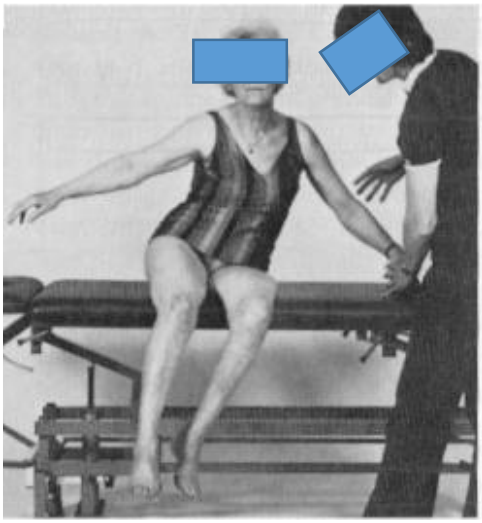


Photo 18

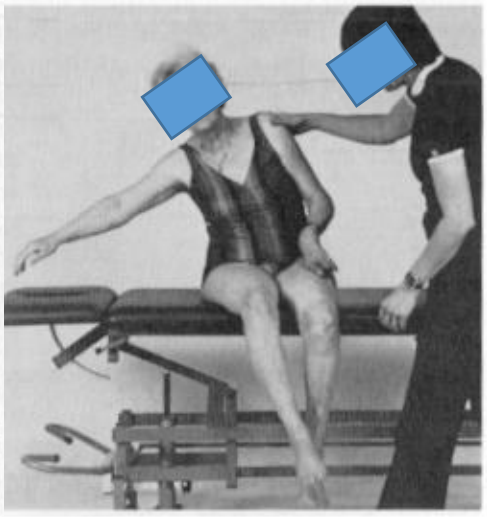


Photo 19

Photo 18 and 19. *Equilibrium reaction to the affected side (18) and the not –affected side (19)Where is the fear it greatest? Look to her face and observe where the tone of the affected side is increasing. When the tone on the affected side is increasing (association reaction) is that an sign that the patient has the feeling to be out of balance and dare to fall.* *Photo 18 and 19 published with the responsibility and permission of the author by j.v.d.Rakt.*

Photo 18 gives an picture that looks like an good equilibrium reaction to the affected side. There is an right head placing, an elongation of the trunk on the affected side and no association reaction in the arm on the affected side.

But when we look to the diagonals activity (front and back together with the homolateral structure [39]) than is it impossible that the diagonals started on the affected side because there is no tone and muscle activity on the side. The affected leg is almost flat, that means that no diagonal can started here because there is no anchor.

The movement to the affected side is **done and controlled** by the not-affected leg, she push their body to the affected side and hold the not-affected leg with pressure against the edge of the bench. With the upper body she makes the shortening of the trunk complete.

The strange aspect on this attitude is, that she is not afraid to push too far. It seems that she has the feeling that this is right and that there is nog danger of falling to the affected side. Look at their face and she dare even to look straight forward.

Photo 19 now the movement through the pushing of the therapist goes to the other side. See the difference photo 18 she makes there the movement to the left, but on photo 19 the therapist must push here to the not-affected side and which picture give that !!

Complete different and also the same movement especially of the head and the trunk.

Different because here face show fear and the tone in their affected arm is increased. An association reaction that will be evoked when the patient feels that the situation is very difficult.

Further is the activity in the not-affected leg different but also the same. When she push their body to the affected side there is extension with endorotation, when she through the push of the therapist goes to the not-affected side there is also extension and endorotation but there should be an exorotation. She try to block the movement to the not-affected side!

Further the same: The head and trunk posture is identical with the movement to the affected side. That means that she used for both movements the same strategy and the same parts of the diagonals on the not-affected side. The difference is on the not-affected side with more tone and she find it difficult to hold their not-affected arm/hand from the table. An sign that she is working against the movement to the not-affected side and she isn't in the middle yet !!

The reaction in the affected arm is an flexion synergy and that means that the diagonal started from the not-affected side in the leg and than cross over to the affected side and pull the scapula

in an retraction and evokes an flexion synergy. (back diagonal dominance , there is also more extension in the not-affected leg[24])
There is still today no investigation that has measured the muscle activity on the affected side by pusher-patients, not in the acute phase or in the chronic phase. With palpation there is tone in the erector trunci but far less than on the not-affected side and the muscle isn't so big , meaning that not all of the muscle react. In the front there is often activity in the stomach muscle but also lesser. The activity in muscle lying deeper there is no record. The buttock muscle are often not active at all and that makes sitting so painful.
Further there is often function in the hand and foot and less in elbow and knee and the lowest function and tone is in the shoulder (almost all pusher patient have an subluxation inferior) and in the hip an hypermobility in the because the attitude in bed is often not always secured[38].
When we bring this patient in an very difficult situation than we see the cross over from especially the back diagonal, but this will be no learning moment but an fear moment that the patient will try to avoid.

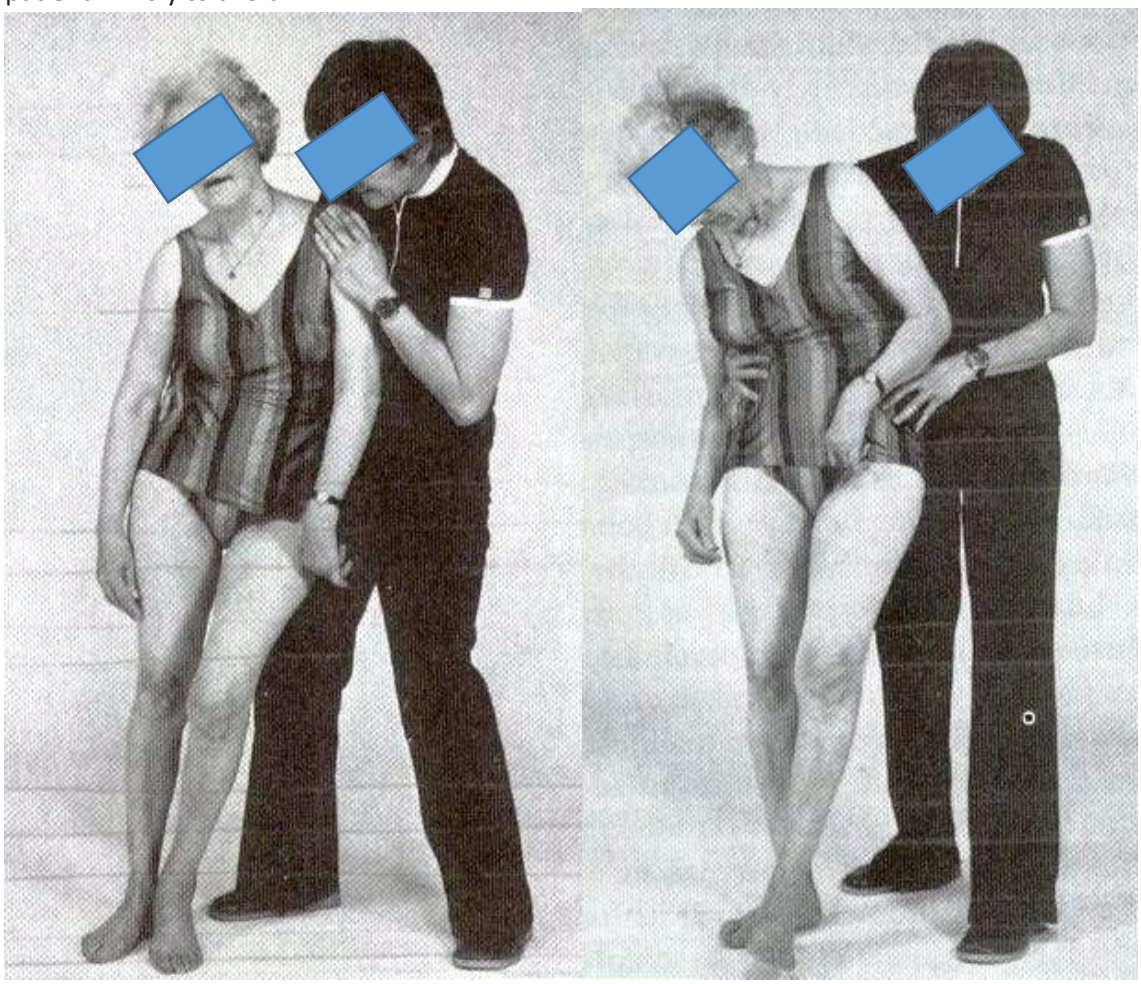


Photo 20 **Photo 21**

Photo 20 and 21. *Now in an standing position. Photo 20 she pushing against the therapist but she looks up and there are no traces of fear on her face. Photo 21 now the therapist try to correct the attitude and now the head is focusing on the legs and the tone in the affected side is strong increased.*
Photo 20 and 21 published with the responsibility and permission of the author by j.v.d.Rakt.

Photo 20 gives an picture of how low the tone is on the affected side and the diagonal (front and back) makes no cross over . The whole body "rest" on the shortening of the trunk on the not-affected side with the homolateral structure of the hip on the not-affected side. The shoulder and the not-affected arm/hand are in an "resting" position.

The confidence that this is the right posture, can be read through the way she looks forward. Photo 21 , she feel that she is push in the “wrong “direction and react with push back that she do with the not-affected leg and she push so hard that the arm goes in an flexion synergy(back diagonal starting from the not-affected leg). The not-affected arm works now, the elbow is flex and press against the hand of the therapist and the patient ribcage on that side and makes the shortening of the upper trunk on the not-affected side higher and she makes an upper trunk movement to the front. That evokes the diagonals of the not-affected side in the upper trunk , both the diagonals and the homolateral structure and there is again an cross over to the affected –side. In the affected leg there is an flexion synergy in the leg evokes through the pelvic shift by increasing the tone of the stomach on the not-affected side. This is also an static reaction as the association reaction in the arm , the cross extension-flexion reaction[57]. Someone believe that there is also an symmetric tonic neck reaction in combination with an asymmetric tonic neck reaction, the first gives flexion arm and extension legs and the second will give more extension on the side the head turns and flexion on the other side.
This gives once more how great the problems are for this patient when she is corrected by others. This situation is so dangerous in her view that she never will learn in this situation !!!

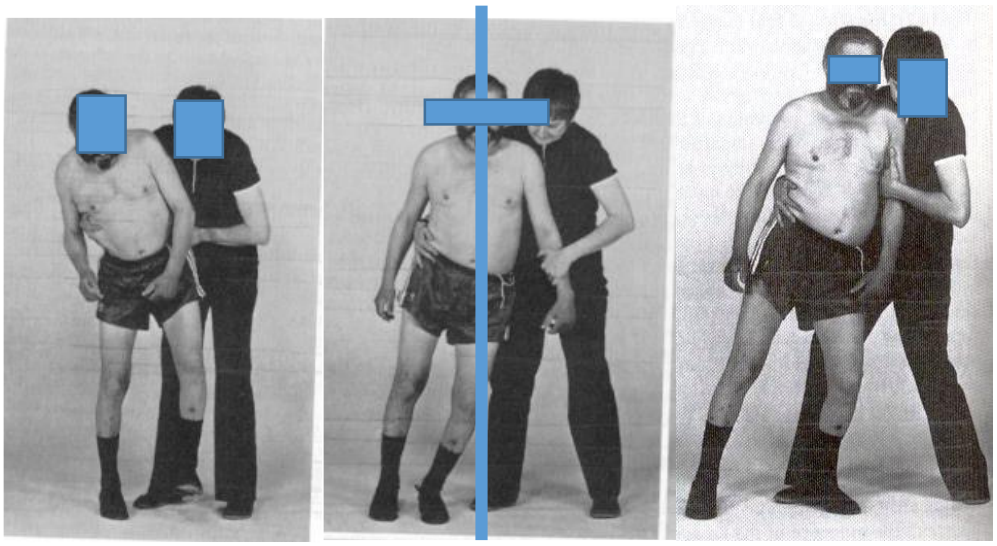


Photo 22 (14) **Photo 23** **Photo 24**

Photo 22,23 and 24.
Photo 22 gives an picture what happen when there is an heavy correction by the therapist. Photo 24 when this correction not present and photo gives an picture when the therapist tries to bring the affected foot to the front and try to get his weight on that leg.
Photo22,23 and 24 published with the responsibility and permission of the author by j.v.d.Rakt.

Photo 23/24 shows the most relaxation by the therapist and the patient. The man looks straight to the front, his face is relax and the tone in his affected part of his body is low. The diagonals on the front and back are not cross over . No increase tone in the affected arm or leg.
In his not-affected leg there is an end position of his knee and when we draw an line starting between the feet than the most of his body is on the affected side. He need support otherwise he fall to the affected side. The blue line is starting between his feet but the amount of weight on the affected leg is limited!
Photo 24 shows the effort that the therapist makes to place the affected foot to the front and hold him there. This to get his weight on that foot and evoke an extension in the affected leg. On both photos the stomach shows no tone increase (the belly on the affected side is bulb) , the diagonal started in the not-affected leg is very active, but not so active that there is an cross over to the affected arm.

Now look to photo 22, there we see the cross over from the back and front diagonals and also from the homolateral structure on the not-affected side. There is an increase in the tone of the arm – flexion synergy- and that means an back diagonal activity evoked by the extension of the not-affected leg . And the affected leg goes in an flexor synergy (look to the perfect "dorsal" flexion of the affected foot that we say also on photo 21) but that means that there is an static reaction. Is there more than only an cross extension –flexion reaction has the head posture also an influence , isn't total clear . Further the diagonal on the front is working from the not-affected arm , pressing the hand of the therapist against the ribcage , the increasing of the tone of the stomach and give flexion abduction and exorotation in the hip, flexion in the knee and dorsal flexion often with supination in the foot.

But there is also fear, the posture of the head and the pressure that he set with his not-affected arm and leg and the present of static reaction, gives an indication that he is working at maximum to push the back the pressure of the therapist. There is here no room for learning !!

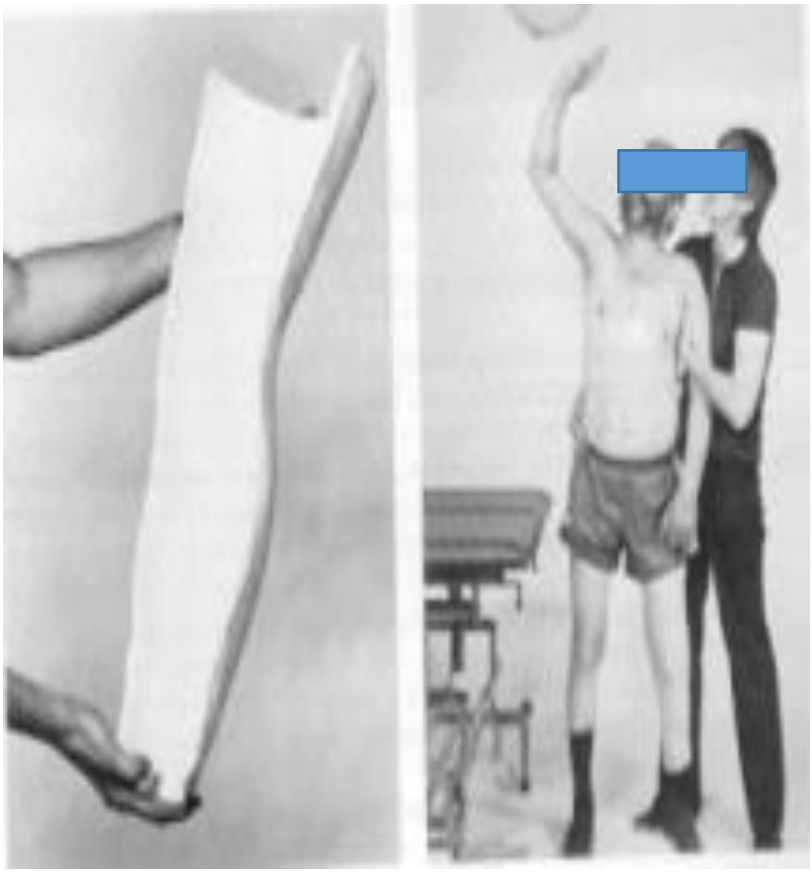


Photo 25 **Photo 26**

Photo 25 and 26.
What are the changes in comparison with the photos 22-24.
On the affected side she had given the affected knee /leg an back splint that fixated his affected leg in extension and she can now bring his weight on that leg. And now we see that there is another cross over of the diagonal , the diagonal on the not-affected side are no longer the only one but the diagonal start now in the affected side and has an great effect.
Photo 25 and 26 published with the responsibility and permission of the author by j.v.d.Rakt.

This photo were made on the same day. An illustrated perfect what an standing exercise with an back splint can bring away !!
With the weight on two feet, there is stability that is recognized in the brain and makes an high tone in the diagonal on the not-affected site not necessary. As reaction we see an decrease of the tone in that part of the body and that makes it possible that he lift his not-affected arm high to play with an balloon. He elongated his not-affected side instead of shortening till an bizarre height.
What happen in bed with the push away orthosis, happen here. When the affected leg has weight , the brain recognized and react.

What Pat. Davies shows us is;

1. What the reaction of the person is when she tries to set the patient in the right posture with equal body mass on both legs.
2. That this reaction evokes all what is possible in the damaged brain even static reaction will be used to create the best possible answer against this “correction”.
3. That no the brain is capable to make an cross over in the diagonals but that cross over always comes from the high activity of the not-affected side. But then it is pathological and has no learning effect.
4. The question that remains is this cross evoked by the not-affected side or can it be an indication of the remaining possibilities on the affected side ?
5. The possibilities, that an patient will of can cooperated and learn how he/she must bring weight on the affected side and use the possibilities on that side are ….. zero !!
6. But an back splint can alter the picture complete and show that good information will enter the damaged brain and that this brain can react on an way that many had never seen before. This approach of Pat. Davies is so brilliant that every time person with the pusher syndrome the back splint creates miracles.
7. Therefore it is very important to get as fast as possible an standing attitude with an back splint and use that back splint every time you feel that the brain don’t find the right information and that this patient will be pushing again. That means that some patient will always have need of some exercise with the back splint and the greatest mistake is leaving the back splint away when walking is possible and think that this equal on moving /walking with the back splint.
8. The learning cost time and especially by this group of patients. Give this group that amount of time and you will be amazed what the results are !!

Conclusions

To start an treatment by patient with an severe stroke and an pusher syndrome is the first concern, that the patient has enough condition to do this.
Than the first attention must be the attitudes, First in bed and wheelchair but very important the standing position and of course an position with little movement .
Dynamic stimuli enter the brain and will help to restore of compensated .
After that the movement – transfers – between this attitudes can be trained and then, it is very important, this always as an treatment part to do and get back to especially the standing position with the back-splint to restore the perceptual mismatch.
This invention of Pat. Davies is so very important not only in the beginning but all away when there is an problem, create this attitude with movement and see how the patient can control his attitude and his movement.
Even walking with an back-splint can then be very therapeutic. Part two will write about the transfers but also over walking with and without back splint and task specific resistance therapy to get more coordination and power.

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ISSN 2385 – 1988 [Online]