

Caroline Martinsson

Leg sjukgymnast, Barn- och ungdomshabiliteringen, Borås
Abducerat omhändertagande och två studier



24 hour Postural management for Hip Health



Ligga, Sitta, Stå (med abduktion)



carolinemartinsson@live.se

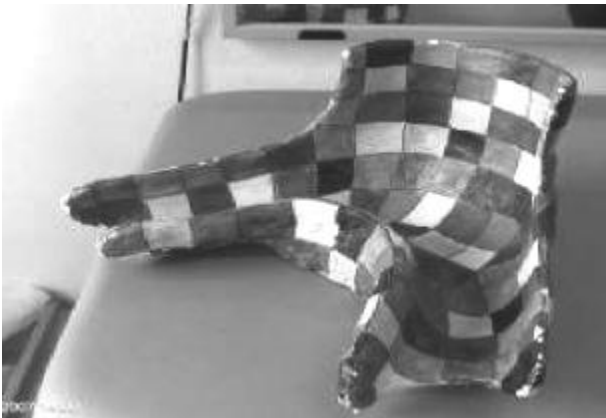


Dessa foton kommer INTE från
Chailey, utan ska ge exempel
på abduktion

Picciolini, 2016



- 51 children with CP, intervention and control groups
- Significant difference has been observed in the MP (%) trend ($p < 0.001$)
- At 2 years, there was a marked worsening (MP from 23.0 to 37.7) in the control group, compared to the stability (from 28.8 to 26.8) in the treatment group.



STÅTRÄNING FÖRHINDRAR KONTRAKTURER!



- Martinsson - kontrakturer bara i kontrollgrupp
- Macias-Merlo - bibehållen ROM
- Salem - ökad ROM
- Gibson - ökad ROM

Tyngdkraften



carolinemartinsson@live.se

Angle matters!



Tyngdkraften



carolinemartinsson@live.se

Angle
matters!



FÖRLUST AV HÖFT-/KNÄEXTENSION GER STORA BEKYMMER

- ❖ Höfter och knän ska vara så raka som möjligt i ståstödet.
- ❖ Kontrollera att bäckenet är i nivå, rakt och inte roterat.
- ❖ Eftersträva symmetri för bål och huvud också

Effect of Weight-Bearing in Abduction and Extension on Hip Stability in Children With Cerebral Palsy

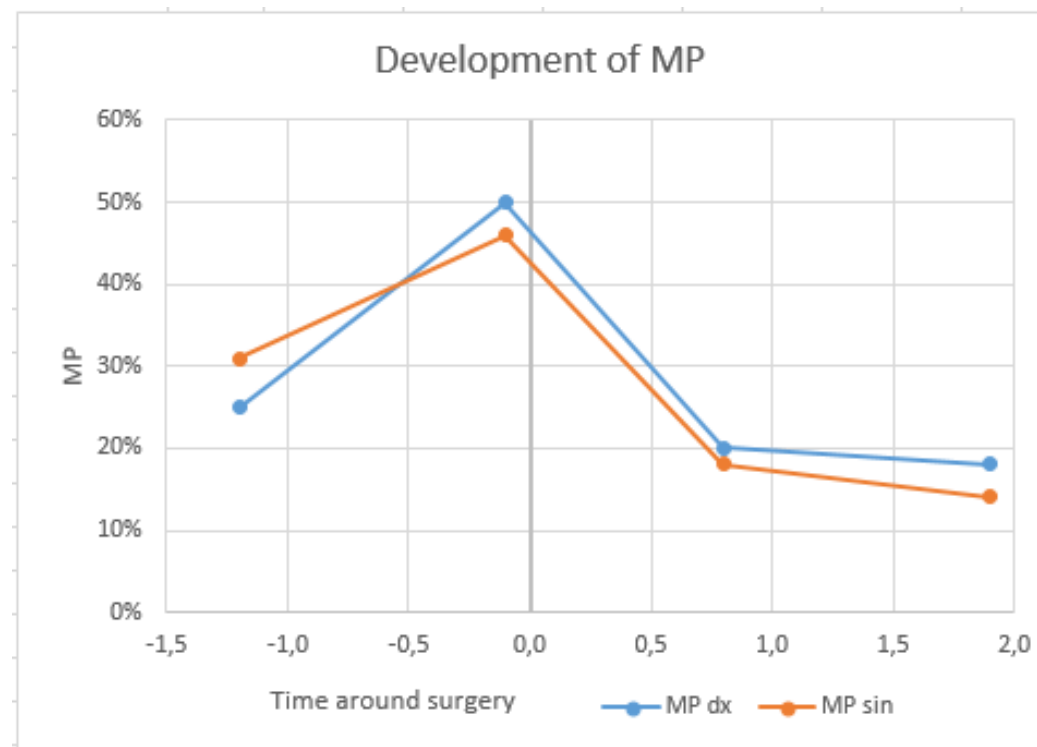
Caroline Martinsson, PT, MSc, Kate Himmelmann, MD, PhD.

Pediatr Phys Ther 2011;23(2):150-157.





Idén till studien



GMFCS classification

GENERAL HEADINGS FOR EACH LEVEL

LEVEL I - Walks without Limitations

LEVEL II - Walks with Limitations

LEVEL III - Walks Using a Hand-Held Mobility Device

LEVEL IV - Self-Mobility with Limitations; May Use Powered Mobility

LEVEL V - Transported in a Manual Wheelchair

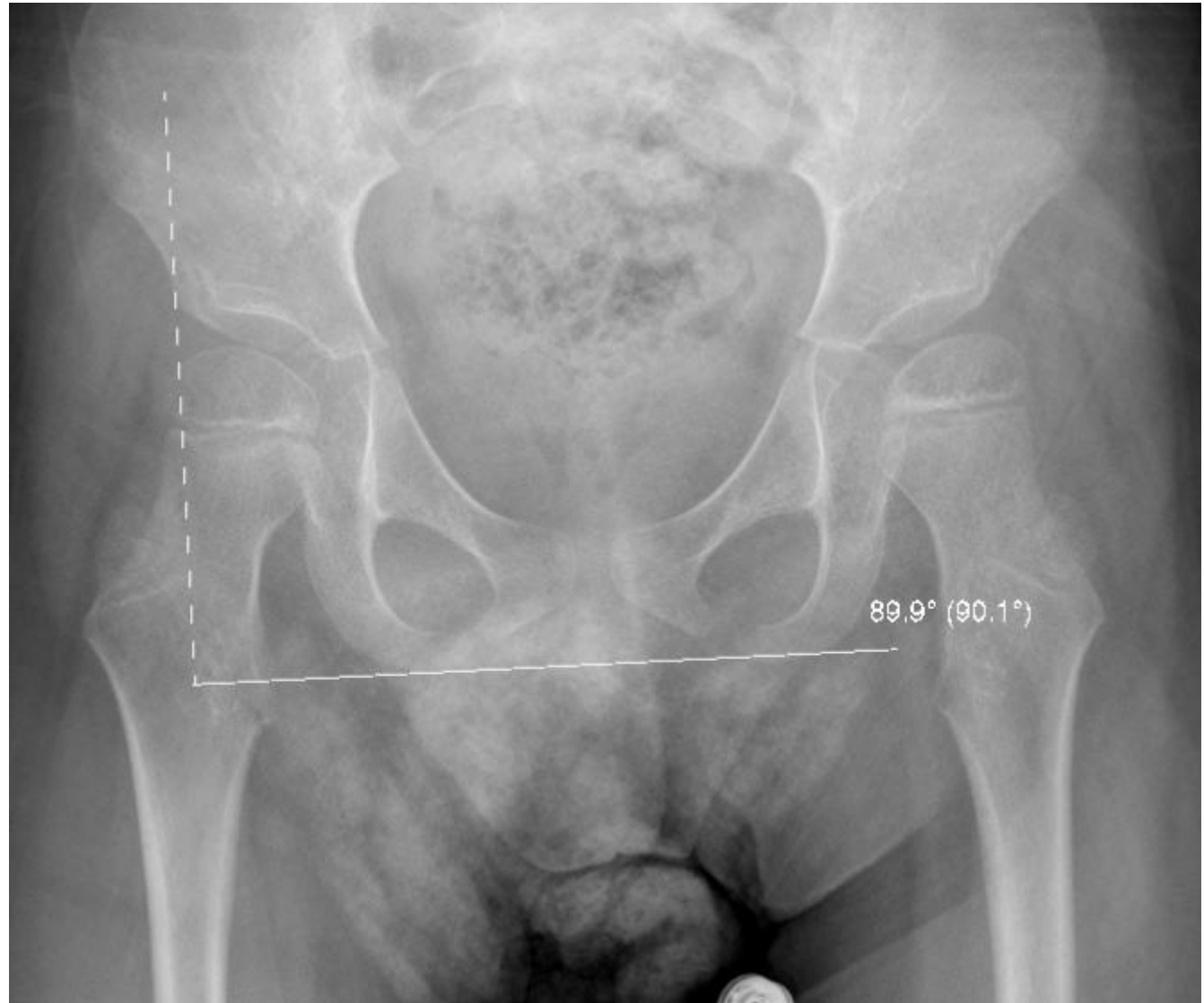


Migration percentage – MP = Reimers index

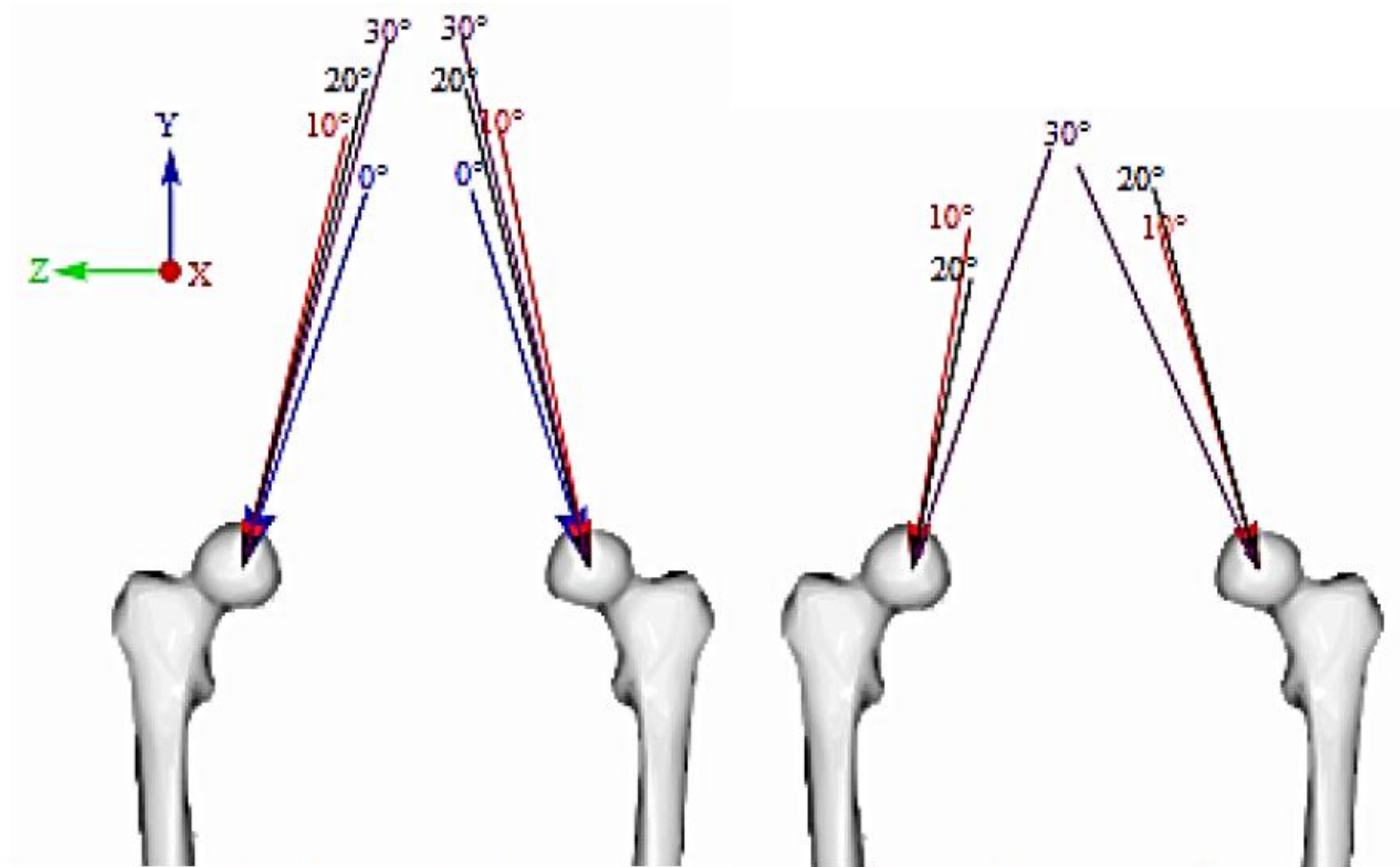
$$MP = A/B \times 100$$



- Exempel på första röntgen i CPUP
- Coxa valga bilat
- Gotiska valv



Höftkontaktkrafter



Publiceras med
tillstånd från
Jennifer Zhen
Lundqvist

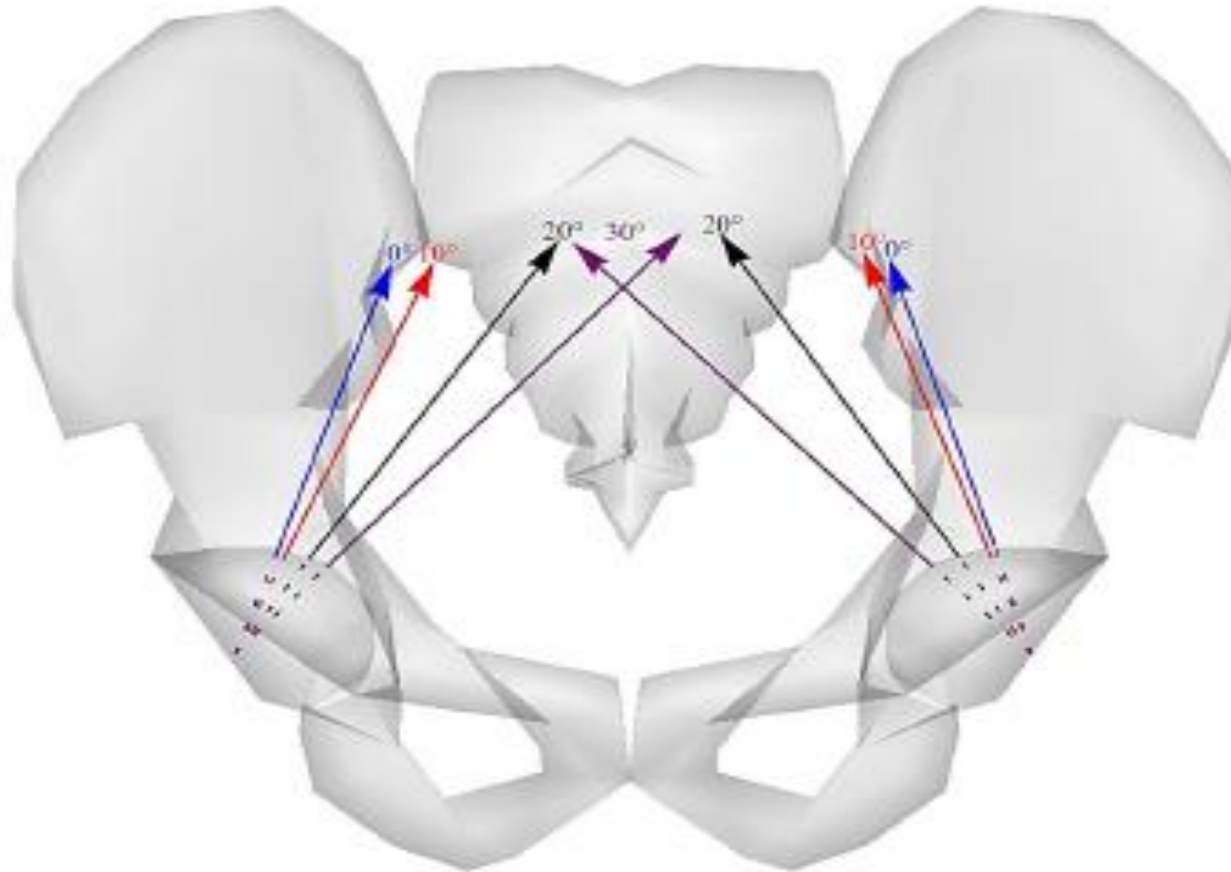
Figur 20. Riktningar för höftkontaktkrafter för grupp 1 respektive 2, uttryckt i femurs koordinatsystem.

Grupp 1 utan kil under fot, grupp 2 med kil

Största belastning med 30° abduktion



Jennifer Zhen Lundqvists studie



Publiceras med
tillstånd från
Jennifer Zhen
Lundqvist

Figur 21. Kraftriktningar på acetabulum för försöken i grupp 1, uttryckt i bäckenets koordinatsystem.

Ref: Yang Z. Effects of Standing Position on Joint Loading – A Pilot Study. KTH STH. EX 2013:93.



Förväntad effekt av abducerat stående

- Kompensera för "coxa valga" genom centrering av caput i leddskålen
- Acetabularkanten får tillväxa utan störning
- Aktiv insufficiens av adduktorer och iliopsoas
- Långvarig töjning av muskler stimulerar till muskeltillväxt
- Ståbredden kan varieras efter vad barnet klarar varje dag.



Frågeställningar

- Kan abducerat stående förstärka effekten efter adduktor-psoas-tenotomi?
- Kan lateralisering av höftkulan förhindras?
- Kan rörlighet i höft och knä påverkas?
- Vad underlättar respektive försvårar abducerat stående?



Abducerat stående



Lutar han för mycket åt vänster?



Eller blev det för mycket åt höger?



Metod

- Ståträna med 25-30° abduktion per ben
 - Mäta abduktionsgrad
- Neutral höft och full knäextension
- 10 timmar per vecka
 - Om möjligt 1½ timmer per dag
- Flera kortare ståperioder per dag är OK
- Ett år
- Några mjukdelsopererades först

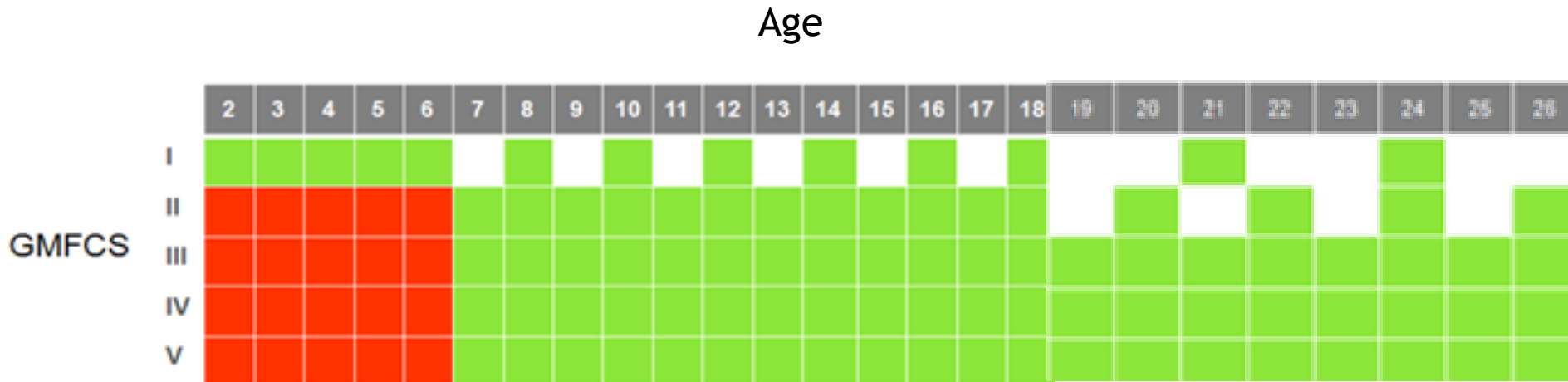


Variabler

- Migrationsprocent (höftutveckling)
- Höftabduktion (saxning)
- Höftextension (start av windswept position)
- Knäextension (start av windswept position)
- GMFCS nivå
- Tid per dag, medelvärde för året
- Abduktionsgrad
- Räknade på sämst höft (vid interventionsstart)



Bedömningsschema i CPUP



Grön: Årlig bedömning

Röd: Två bedömningar detta år

Vit: Ingen bedömning detta år

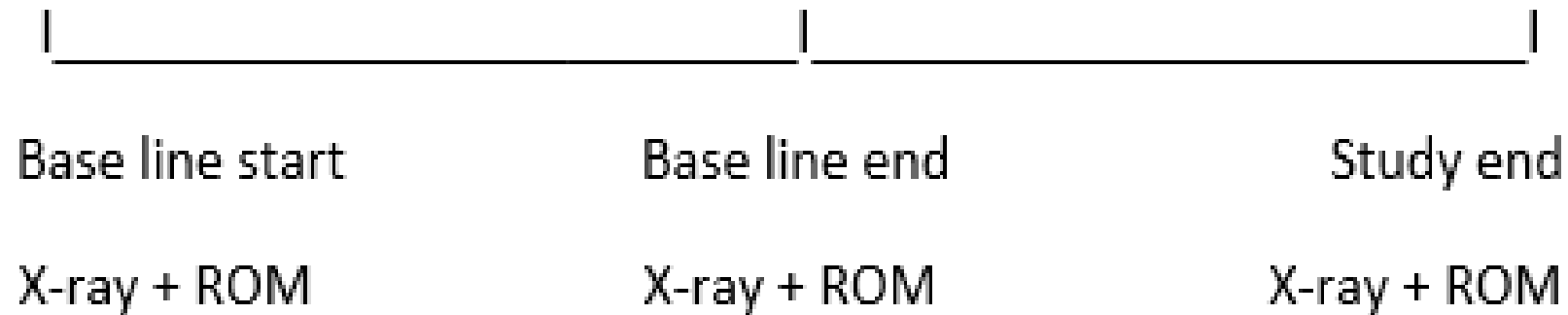


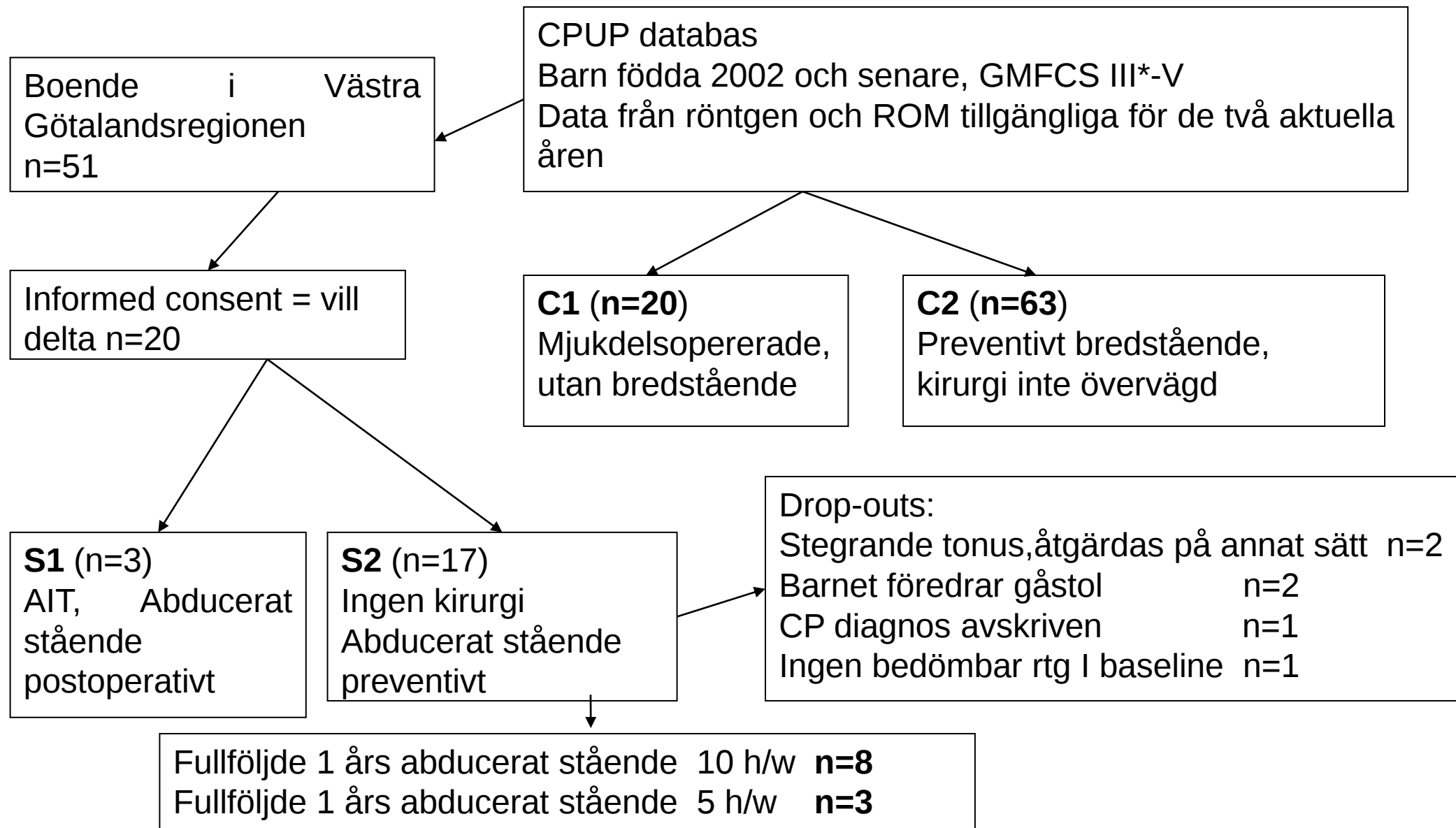
Time table

Surgery

Base line year

Intervention year



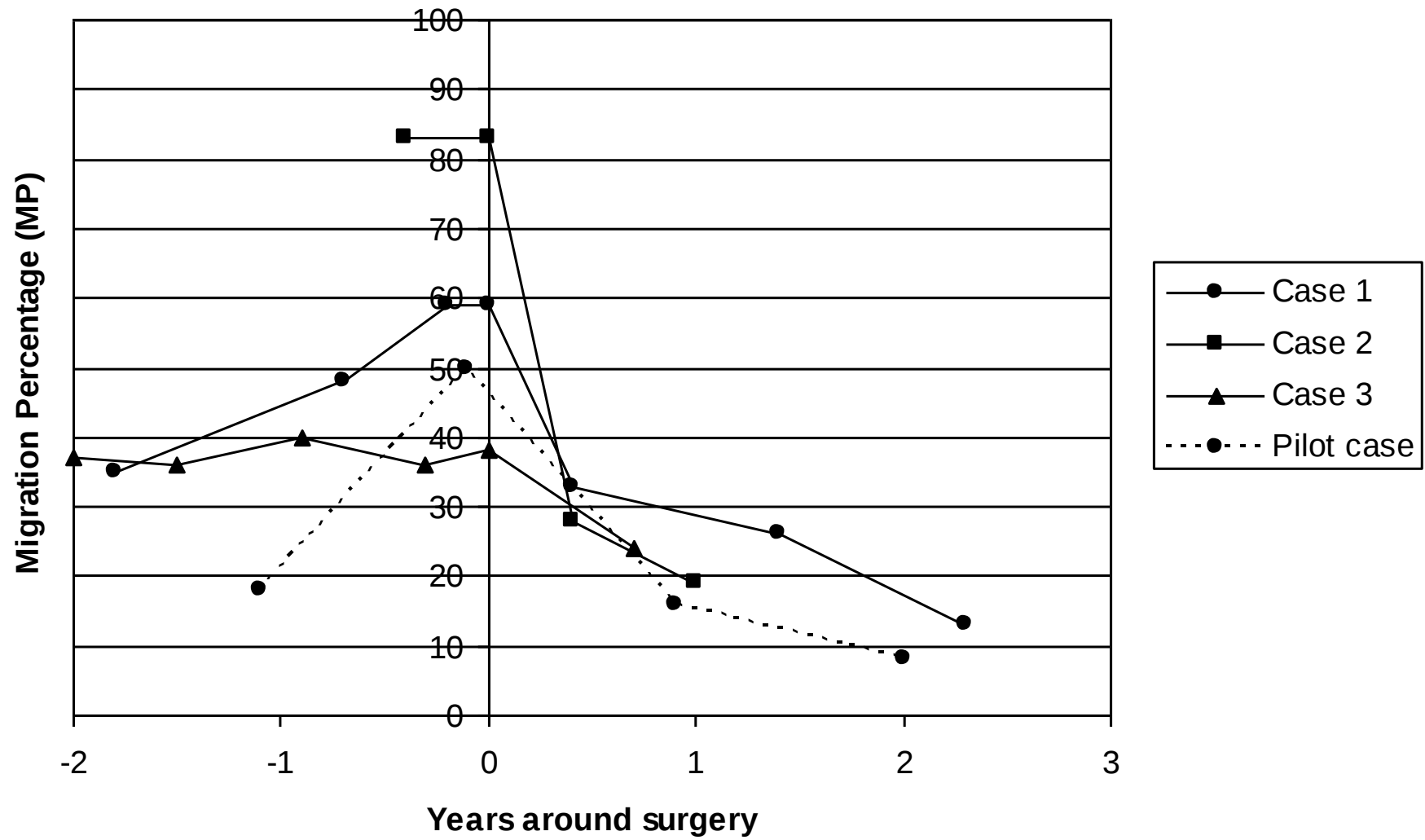


Studiegrupper 2008

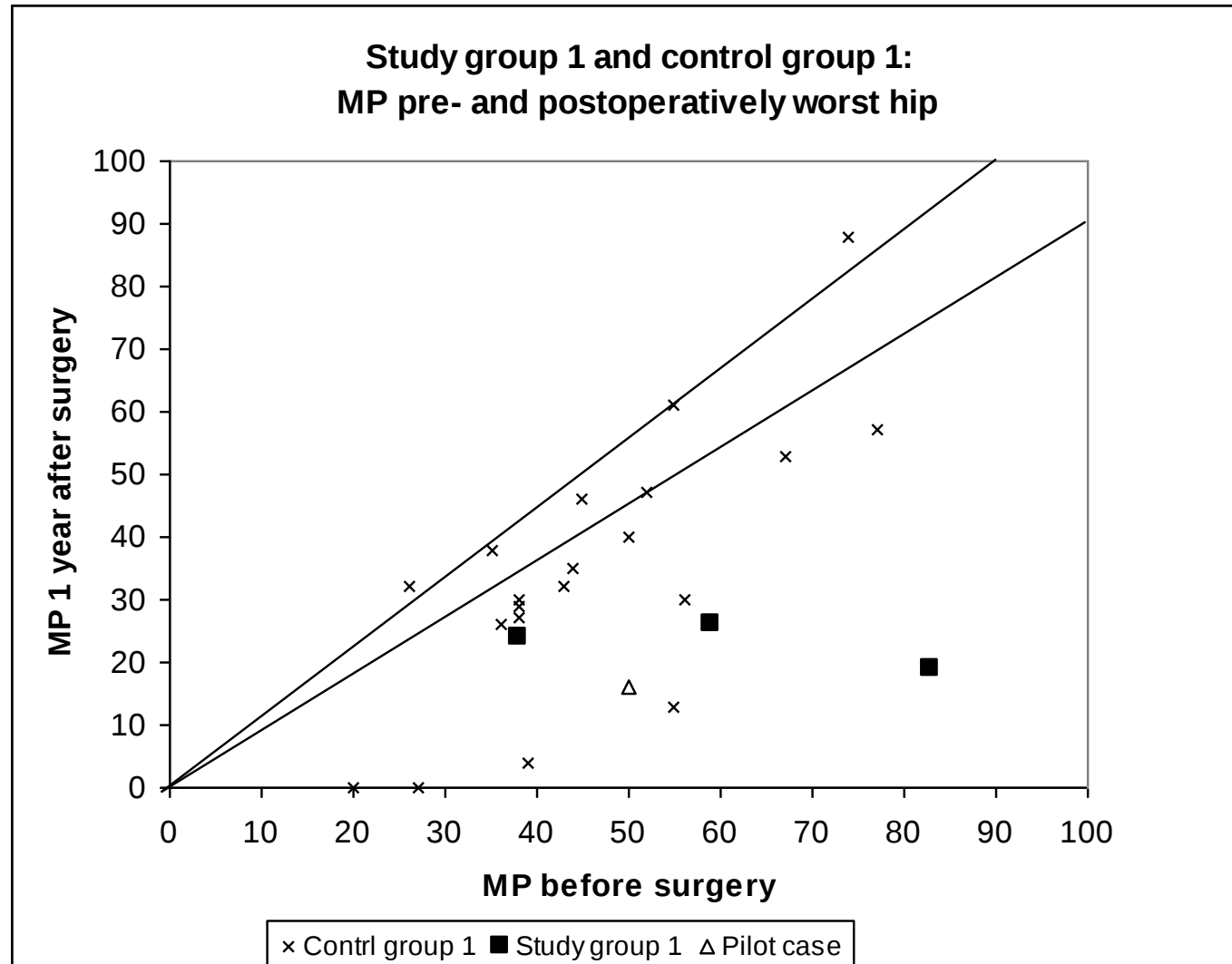
- **S1:** Adduktor-iliopsoastenotomi bilat. +
daglig abducerat stående (n = 3)
- **S2:** Dagligt abducerat stående (n = 11)
- **C1:** Adduktor-iliopsoastenotomi bilat. (n = 20)
- **C2:** Ingen kirurgi (n = 63)



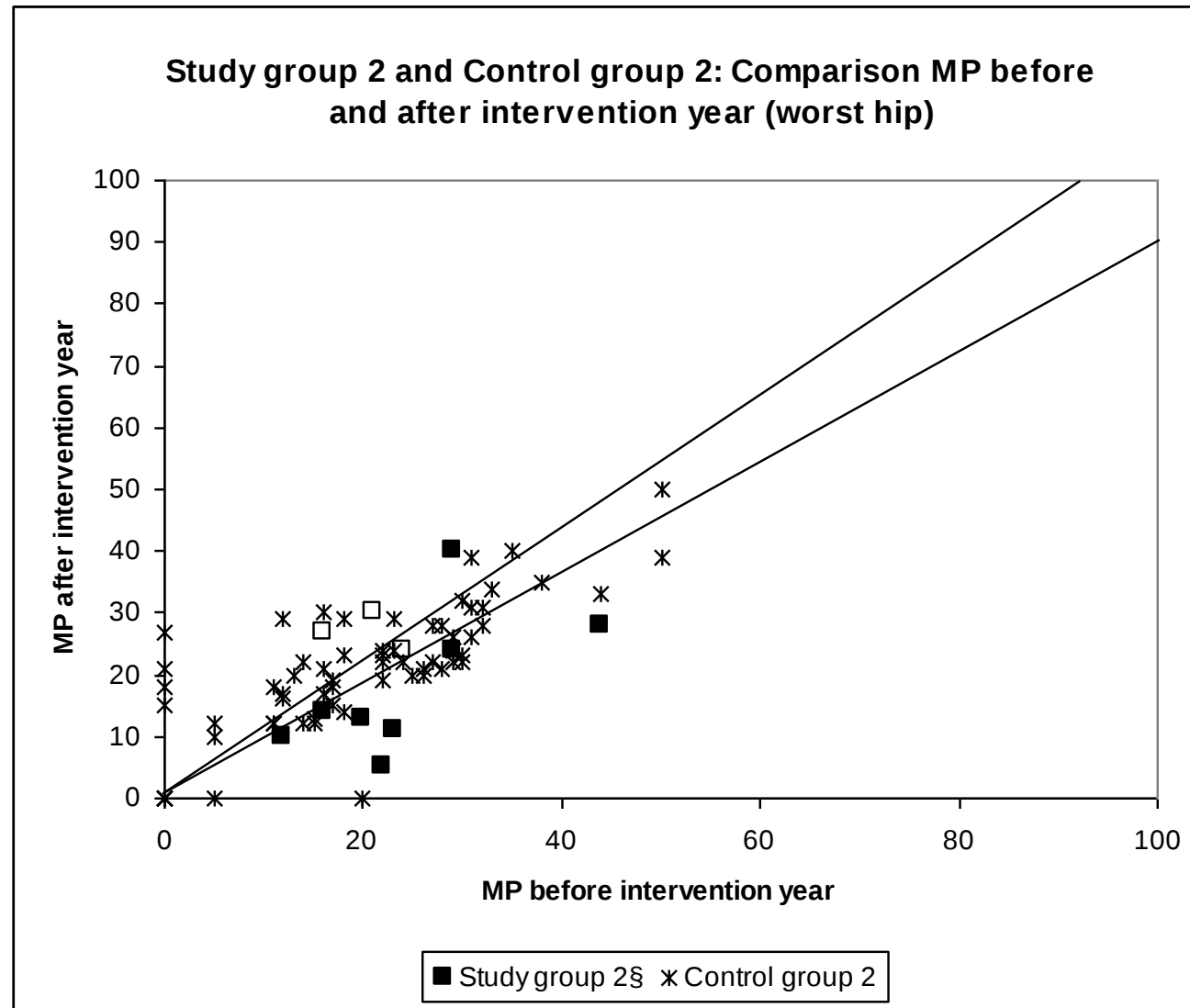
Study 1 - development of MP around AIT, surgery worst hip



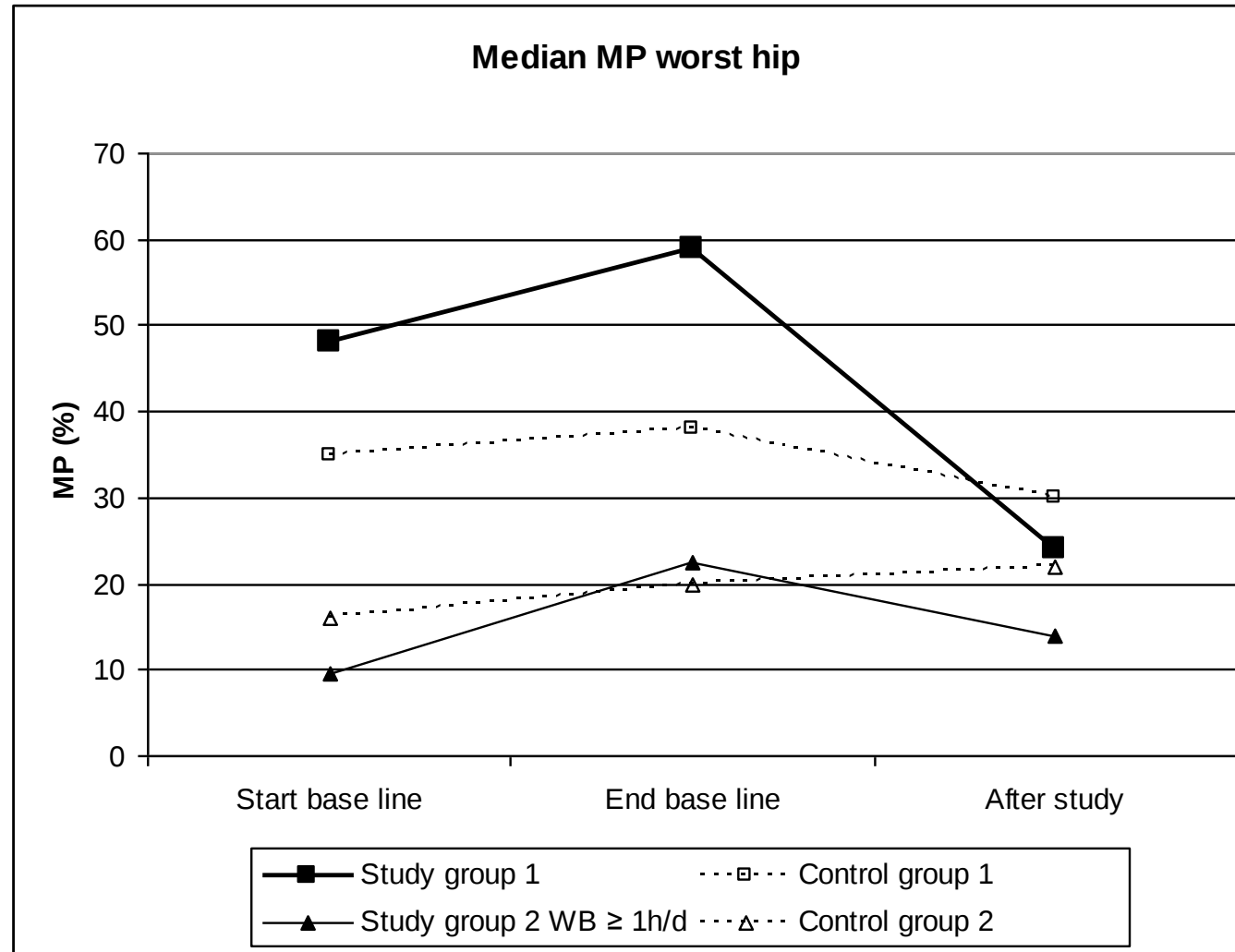
Resultat för barn efter mjukdelskirurgi



Resultat för studie- and kontrollgrupp utan kirurgi



Förändring av Median, alla grupper



Statistisk beräkning

- **Multipl linjär regressionanalys**
 - Beroende variabel
 - Change of MP before - after intervention
 - Oberoende variabel:
 - 10 tim bredstå MP: - 8,6 % $p = 0.000$ (n=8/86 kontroller)
 - Mjukdelskirurgi MP: - 11,9 % $p = 0.000$ (n=23/74)
- Oberoende variabel
 - Kombination MP: - 20,8 % $p = 0.035$ (n=3/20)



Gränser för passiv ROM i CPUP

GMFCS IV - V	Rött	Gult		Grönt
Hip abduction	$\leq 20^\circ$	$> 20^\circ$	$< 30^\circ$	$\geq 30^\circ$
Hamstrings angle	$\leq 120^\circ$	$> 120^\circ$	$< 130^\circ$	$\geq 130^\circ$
Knee extension	$\leq -20^\circ$	$> -20^\circ$	$< -11^\circ$	$\geq -10^\circ$
Dorsiflexion foot, bent knee	$\leq 0^\circ$	$> 0^\circ$	$< 10^\circ$	$\geq 10^\circ$
Dorsiflexion foot, straight knee	$\leq -10^\circ$	$> -10^\circ$	$< 0^\circ$	$\geq 0^\circ$
Hip intern rot	$\leq 30^\circ$	$> 30^\circ$	$< 40^\circ$	$\geq 40^\circ$
Hip extern rot	$\leq 30^\circ$	$> 30^\circ$	$< 40^\circ$	$\geq 40^\circ$
Elys test	$\leq 90^\circ$	$> 90^\circ$	$< 110^\circ$	$\geq 110^\circ$
Hip extension	$\leq -10^\circ$	$> -10^\circ$	$< 0^\circ$	$\geq 0^\circ$



MP och ledrörlighet i alla grupperna

Table 2.

		MP		Hip abduction		Hip extension		Knee extension	
		MP $\geq 40\%$	40% > MP $\geq 33\%$	$\leq 20^\circ$	21-29°	$\leq -10^\circ$	-9- -1°	$\leq 20^\circ$	-19- -11°
Study group 1 n=3	End base line	2	1	1	1	0	0	1	1
	End study	0	0	0	0	0	0	0	0
Control group 1 n=20 (ROM n=12)	End base line	11	6	1	3	0	1	0	1
	End study	7	2	2	0	2	1	1	0
Study group 2 n=11	End base line	1	0	2	0	0	0	0	0
	End study	1	1	0	1	0	0	0	1
Control group 2 n=63	End base line	3	3	3	4	3	1	0	2
	End study	1	6	1	2	3	4	0	0



DISKUSSION

- Logiskt att abducerat stående skulle underlätta höftutvecklingen
- Hur brett är brett nog för effekt? Inget svar.
- Minst 1 tim/dag 7 dagar/vecka som prevention
- Position så nära vertikalt som möjligt
- Lättare använda händerna
- **Liten studie, Få deltagare**



Underlättande faktorer

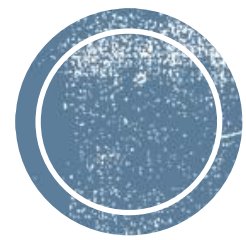
- Lätt ändra ståbredd och höft- och knä-extension
- Föräldrar rapporterar barn mjukare vid dagliga aktiviteter
- Huvud kontroll
- Dyskinetiska barn fick lättare ihop sina händer till lek.
- Barnen accepterade positionen => föräldrarna positiva
- Alla önskade fortsätta stå så här



Försvårande omständigheter

- Första intrycket: Kan mitt barn stå så där?
 - Sett Gustav stå - visste vad som väntade
- Balansakt mellan långvarig töjning och vad barnet tolererade





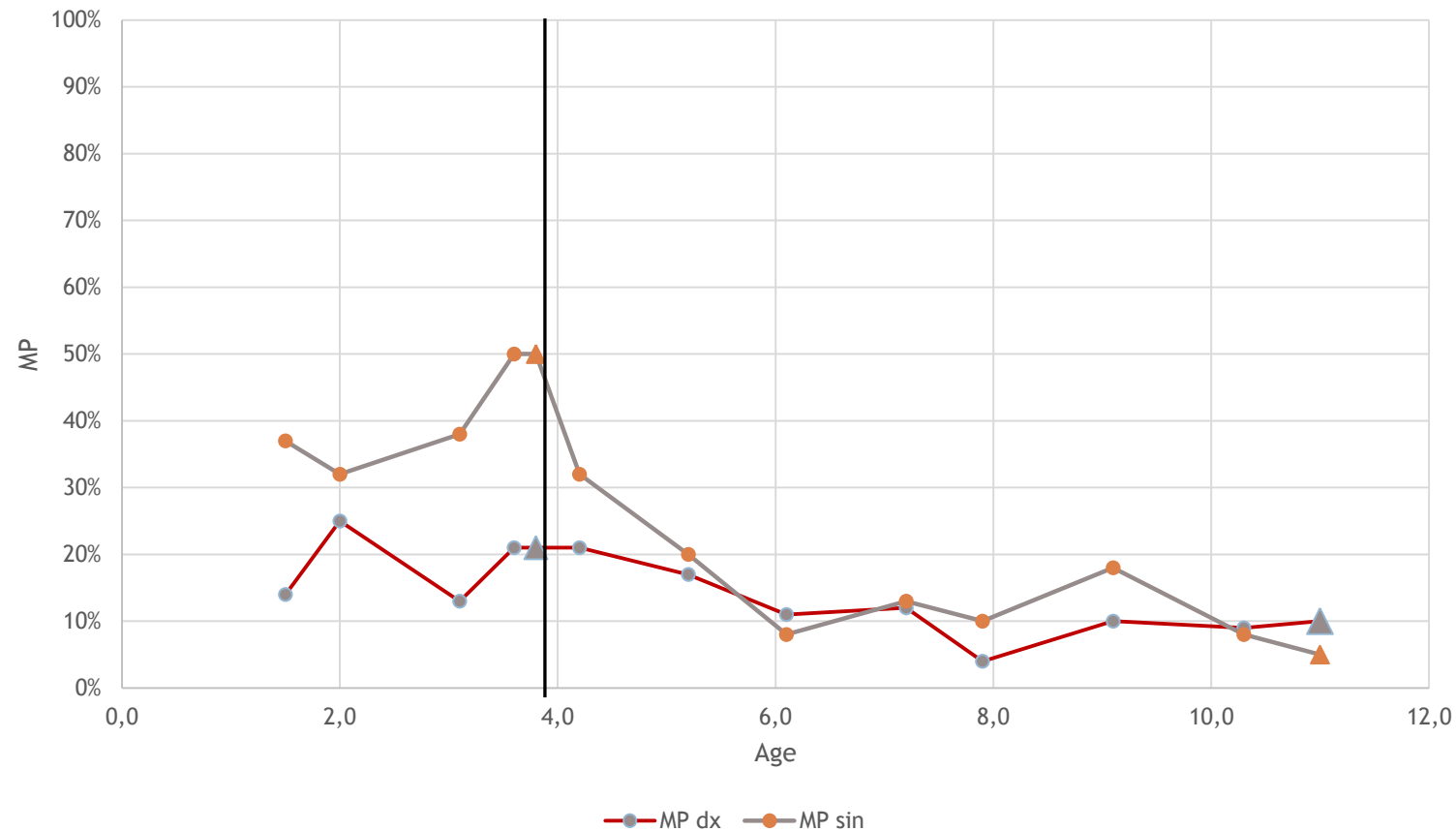
Studien avslutades 2009.

Hur gick det sen?

Exempel:

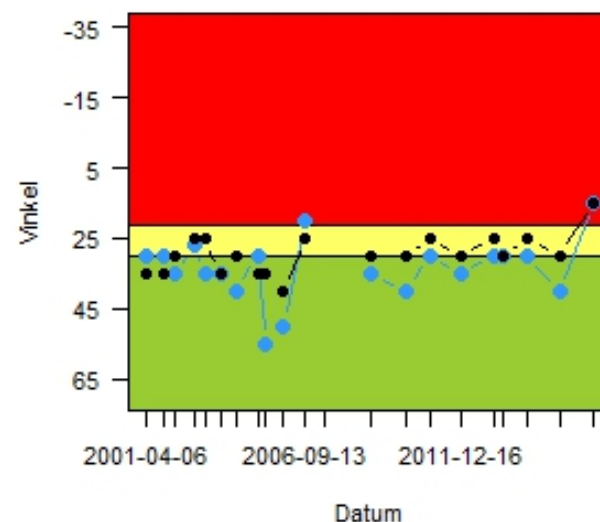
Abducerat stående i 7 år postoperativt till 11 års ålder

Development of MP - VD
Straddled between triangles



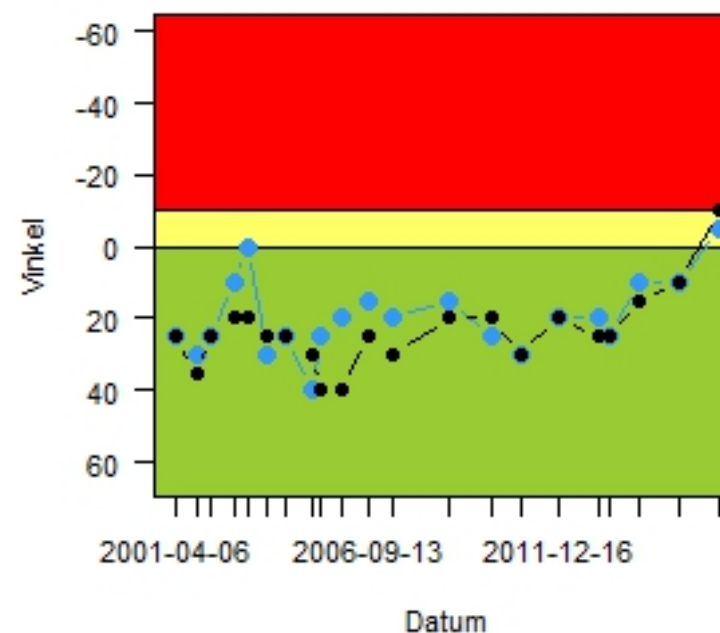
Abducerat stående bibehöll rörlighet i abduction...

Undersökningsdatum	Höftabduktion höger	Höftabduktion vänster
2016-06-28	15	15
2015-05-07	40	30
2014-03-21	30	25
2013-05-28	30	30
2013-02-11	30	25
2011-12-16	35	30
2010-12-03	30	25
2010-02-17	40	30
2008-12-03	35	30
2007-05-14		
2006-09-13	20	25
2005-12-08	50	40
2005-05-02	55	35
2005-01-27	30	35
2004-05-06	40	30
2003-10-23	35	35
2003-04-15	35	25
2002-11-26	27	25
2002-04-04	35	30
2001-11-06	30	35
2001-04-06	30	35

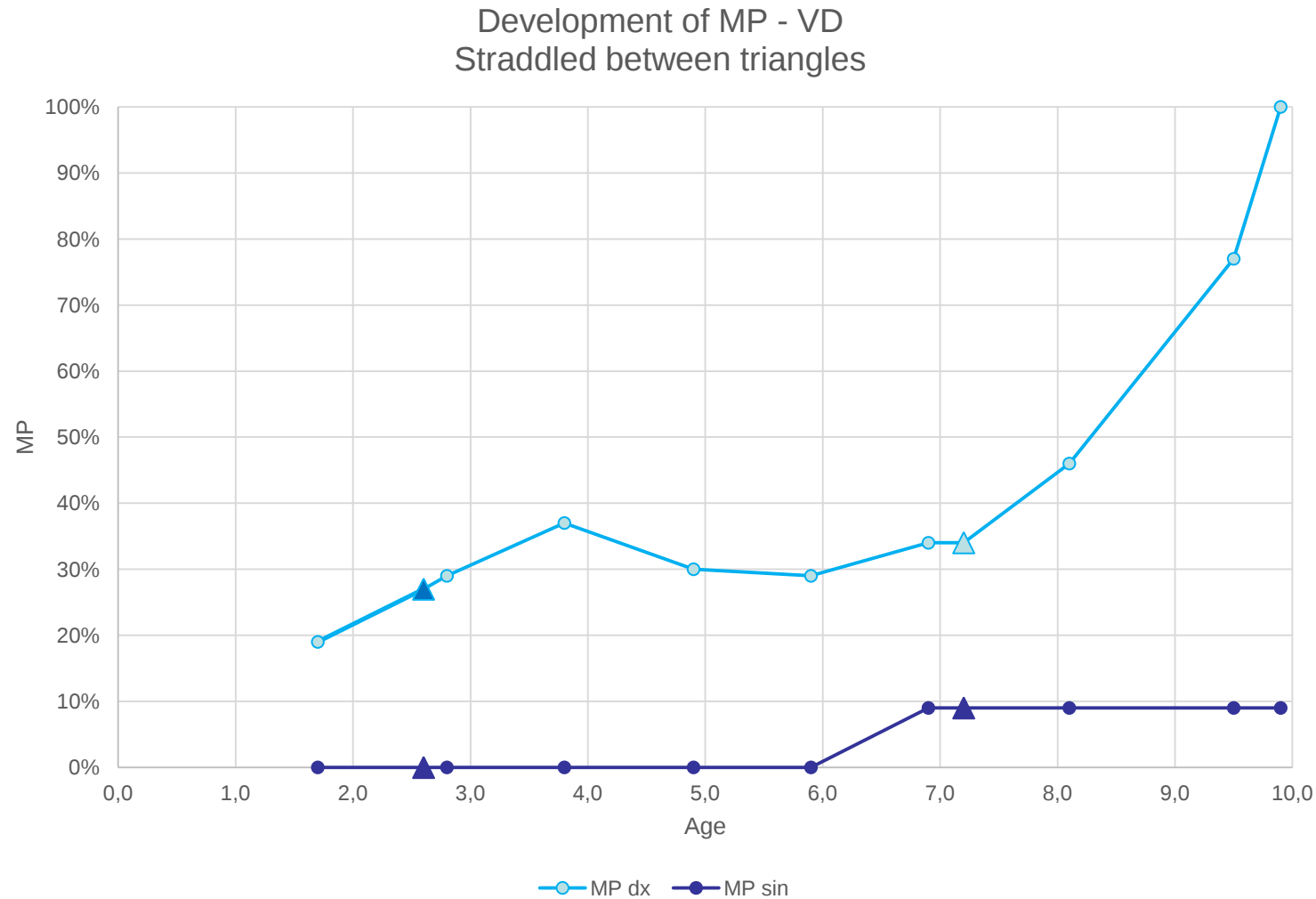


...och Dorsalflexion med rakt knä

Undersökningsdatum	Dorsalflexion sträckt knä höger	Dorsalflexion sträckt knä vänster
2016-06-28	-5	-10
2015-05-07	10	10
2014-03-21	10	15
2013-05-28	25	25
2013-02-11	20	25
2011-12-16	20	20
2010-12-03	30	30
2010-02-17	25	20
2008-12-03	15	20
2007-05-14	20	30
2006-09-13	15	25
2005-12-08	20	40
2005-05-02	25	40
2005-01-27	40	30
2004-05-06	25	25
2003-10-23	30	25
2003-04-15	0	20
2002-11-26	10	20
2002-04-04	25	25
2001-11-06	30	35
2001-04-06	25	25



Abducerat stående i 4,5 år till 7,2 års ålder



Hur gick det för de andra?

- Ny retrospektiv studie med hela CPUP Sverige.
- Hade fler barn långvarigt resultat av bredståendet?
- 108 barn identifierades ha använt $<10^\circ$ abducerat stående under någon period.
 - 16 preventivt stående + 13 postoperativt
 - För 79: oklart med vilken ståbredd och under vilken period de stått så (ej intervjuade)
- Många fler använder $5-10^\circ$ abduktion.
 - Inte inbjuda p.g.a. Jennifers bevisning.



Vilka barn står abducerat?

- Knappast normalfördelat i CPUP.
- Troligen de med oroande höga MP vid tidiga höftröntgenkontroller
- Barn med besvärligt hög muskelspänning



Long-term Effects of Standing with Abduction on Hip Stability in Non-ambulant Children with Cerebral Palsy

Caroline Martinsson, PT, MSc, Kate Himmelmann, MD, PhD.



Plan

Jämföra



Perioder med Naturalförlopp (1 - 7 år) med

Perioder med abducerat stående och/eller

Perioder efter ALT kirurgi (1-7 år)

Data: MP, ROM och HSA

Exklusionskriterier: När skelettkorrektion gjordes

Deltagare

Studiegrupper S n=29

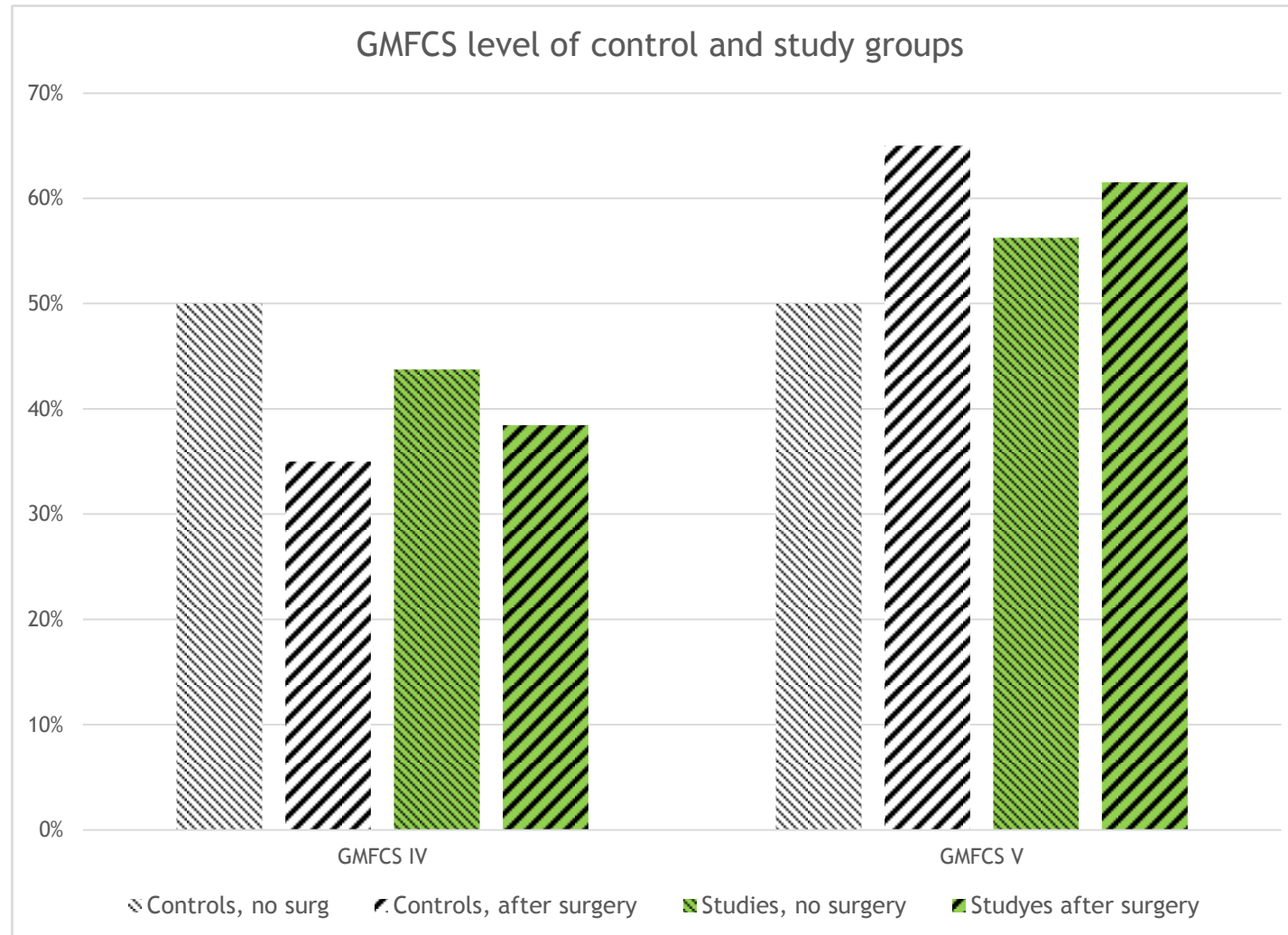
- S1: Abducerat stående efter AIT 1-7 år
n=13
- S2: Abducerat stående preventivt 1-7 år
n=16

Kontrollgrupper C n=240

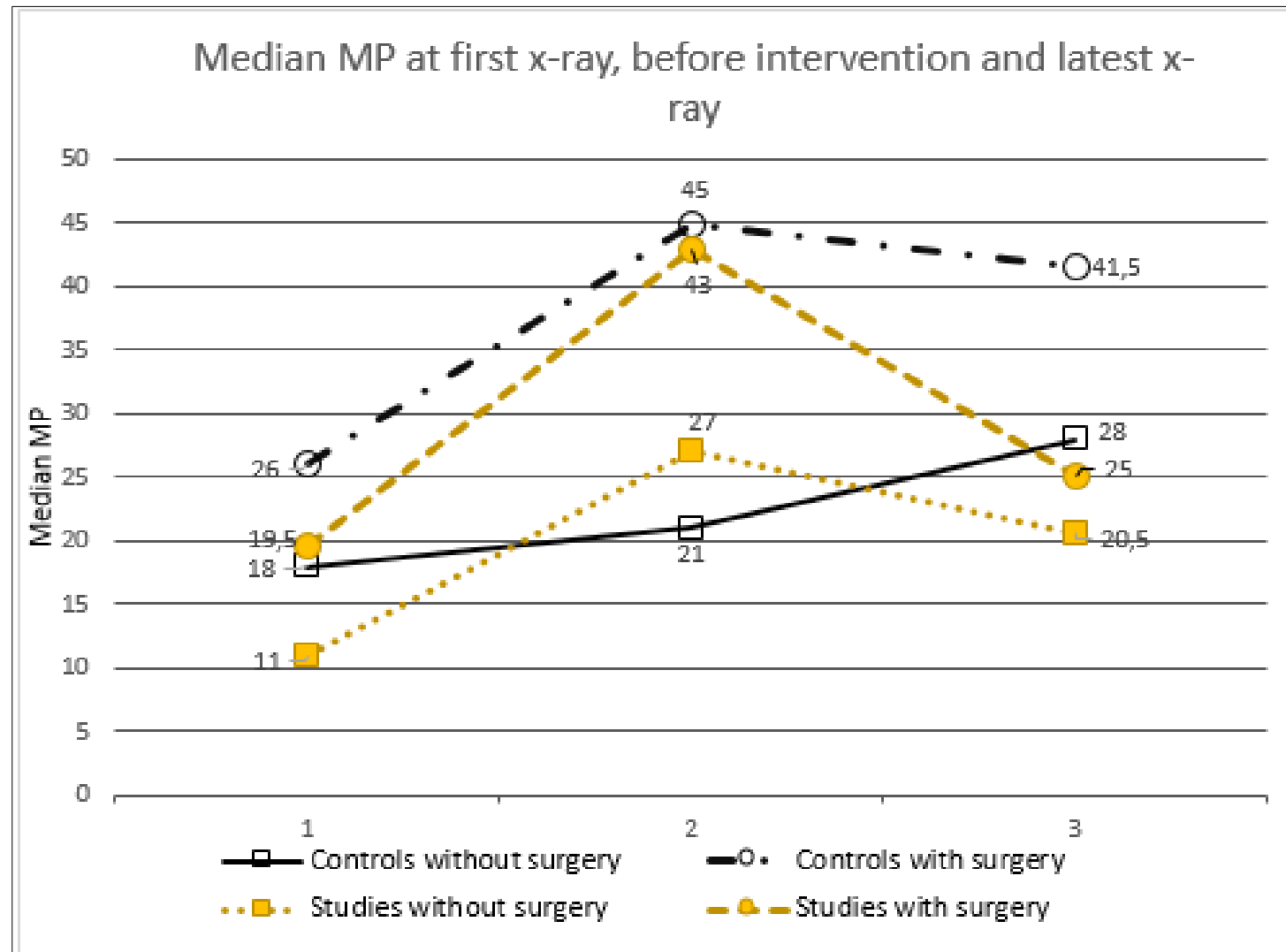
- C1: Kontroller efter AIT
n=80
- C2: Kontroller utan kirurgi
n=160



GMFCS-nivå i alla grupper



Median MP för alla grupper



Statistiska beräkningar

- Multipel linjär regressionsanalys

- Beroende variabel

- Förändring av MP före - efter intervention

- Oberoende variabel:

- 10 t/v abducerat stående MP: -12 % p = 0.001 (n=29/240 kontroller)
 - 30° störst effekt, 15° minst effekt.
 - Mjukdelskirurgi MP: - 7,5 % p = 0.003 (n=93/176)
 - GMFCS nivå MP: 7,3 % p = 0.03 (n=120/149)
 - Subdiagnos ns
 - Kombination:
 - Mjukdelskirurgi + abd.stående MP: - 18 % p = 0.026 (n=13/80)
 - Höftabduktionsrörlighet postop p = 0.013 (n=13/80)



Resultat

- Barn som mjukdelsoopererats
 - Kontroller som reopererades inom 1-2 år 26 of 80 = 33 %
 - Studiebarn som reopererades 1 of 13 = 8 %
- Preventivt stående barn
 - Kontroller utan tidigare kirurgi som opererats senare 28 of 160 = 18 %
 - Studiebarn som opererades senare 2 of 16 = 13 %



**SOPAC –
- APPTAC
Keystone,
Colorado
2016**



Hip Health for Children with Cerebral Palsy

Speakers: Ginny Pateg, Lourdes
Macias, Caroline Martinsson,
Carol Shrader, Wade Shrader

2016-11-09, Keystone, Colorado



Fabrication of the Stander in Abduction. Lourdes

- The stander was painted with plaster paint after 24h drying
- Velcro is used to stabilize the knees and the pelvis.
- The parents were informed about home use of the stander
- Instruction included assurance that the feet were positioned correctly for symmetrical weight-bearing.



Positioning for Children GMFCS Levels III-V: focus on hip health



ABOUT *THIS* TOOL

Positioning may play a role in the prevention and management of hip displacement/dislocation in children with cerebral palsy, Gross Motor Function Classification System (GMFCS) [1] levels III-V. Clinical recommendations in this tool are informed by clinical expertise. Recommendations informed by the research evidence are **bolded** with reference(s) in brackets. This tool augments clinical practice and does not replace clinical assessment, judgment and reasoning.

GUIDING PRINCIPLE: Aim for symmetry of pelvis, trunk, neck and head in all positions. Change position to encourage motor development and movement.



Positioning for Children GMFCS Levels III-V: focus on hip health



REFERENCES

1. Palisano, R., Rosenbaum, P., Walter, S., Russell, D., Wood, E., & Galuppi, B. (1997). Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 39, 214-223.
2. Porter, D., Michael, S., & Kirkwood, C. (2008). Is there a relationship between preferred posture and positioning in early life and the direction of subsequent asymmetrical postural deformity in non ambulant people with cerebral palsy? *Child: care, health and development*, 35,5, 635-641
3. Poutney, T., Mandy, A., Green, E & Gard, P. (2009). Hip subluxation and dislocation in cerebral palsy – a prospective study on the effectiveness of postural management programmes. *Physiotherapy Research International*, 14 (2), 116-127
4. Paleg, G. S., Smith, B.A., & Glickman, L.B. (2013). Systematic Review and Evidence-Based Clinical Recommendations for Dosing of Pediatric Supported Standing Programs. *Pediatric Physical Therapy*, 232-247
5. Hankinson, J. & Morton, R.E. (2002). Use of a lying hip abduction system in children with bilateral cerebral palsy; a pilot study. *Developmental Medicine and Child Neurology*, 44, 177-180
6. Martinsson, C., & Himmelmann, K. (2011) Effect of weight-bearing in abduction and extension on hip stability in children with cerebral palsy. *Pediatric Journal of Physical Therapy*, 23, 150-157
7. Dalen, Y., Saaf, M., Rignertz, H., Kelfbeck, B., Mattsson, E. & Haglund-Ackerlind, Y. (2010). Effects of standing on bone density and hip dislocation in children with severe cerebral palsy. *Advances in Physiotherapy*, 12, 187-193



INFANTS: AGES 0-2 YEARS

SUPINE

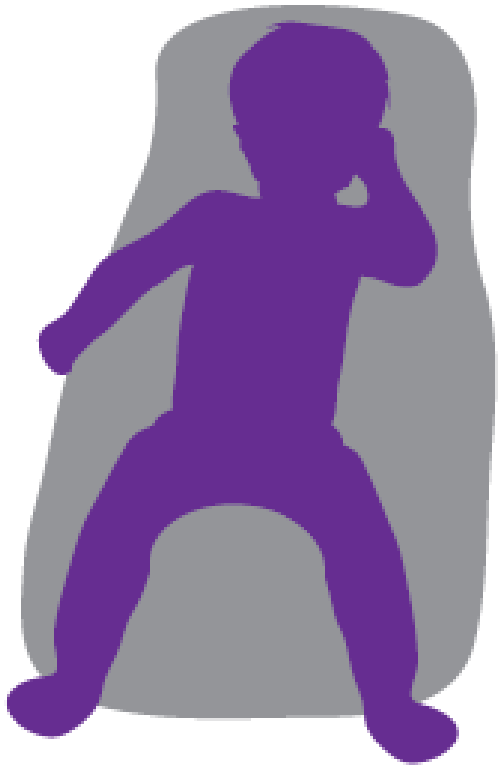
Use positioning pillows, rolls, wedges and positioning devices that hold their shape.

INFANTS IN SUPINE: Introduce early, in hospital if possible.

SUPPORTS: Laterally at the pelvis, trunk and head, and trough supports under the thighs and calves, heels may be free or supported. **Avoid asymmetrical lying posture [2].**

HIP POSITION: Aim for **hip abduction 15-30°** [3]; hip flexion 10-40°; and hip external rotation 5-30°.

DOSAGE: Use daily as per the infant's tolerance.



SITTING

Adapt commercially available baby highchairs, strollers, and/or use positioning equipment such as floor sitters or small seats.

INFANTS IN SITTING: Introduce around 5 months as per the infant's tolerance. Gradually bring to more upright position to encourage head control.

SUPPORTS: Lateral at the pelvis, trunk and head. Shape pommels and/or seating system to encourage hip abduction and external rotation and aligned foot position.

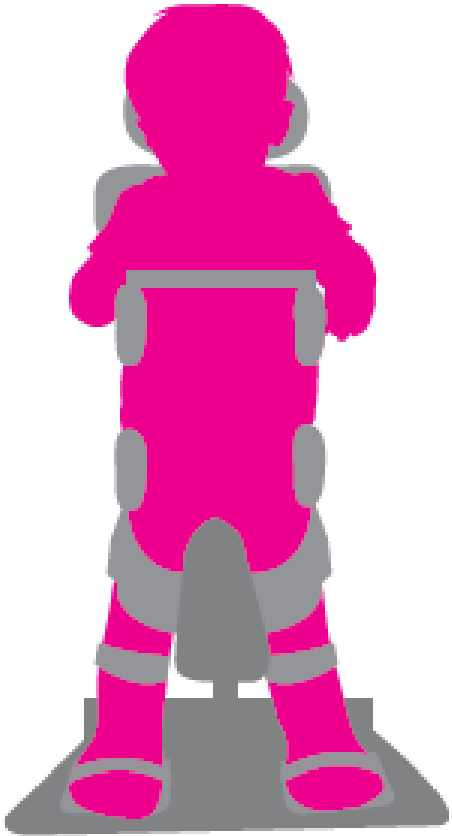
HIP POSITION: Aim for **hip abduction 15-30°** [3] as tolerated and hip external rotation 5-15°.

DOSAGE: Use daily as per the infant's tolerance.



Infants 0-2 Years

STANDING



Use a supine, prone or upright standing frame.

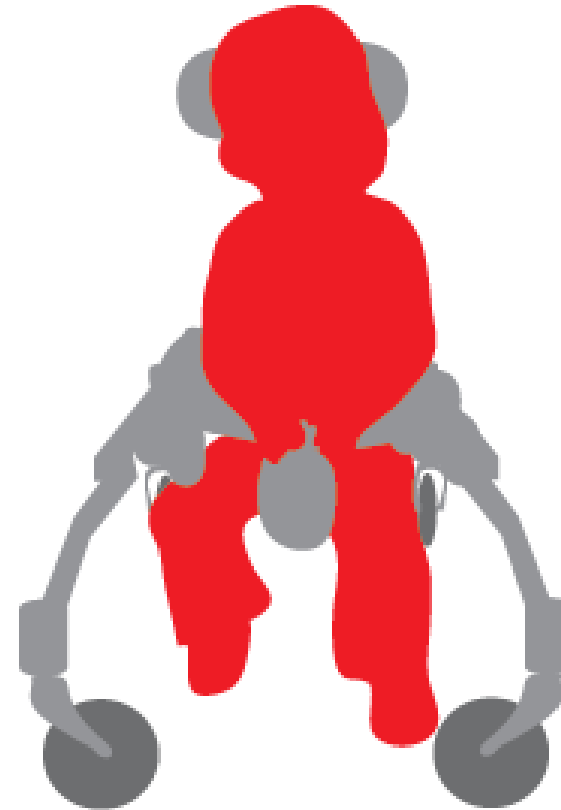
INFANTS IN STANDING: Introduce standing after 9-10 months of age.

SUPPORTS: Head, trunk, upper limb (via a tray), pelvic, knee (via straps above and below the knee), pommel and foot. Use tilt to provide support and encourage head control.

HIP POSITION: Aim for 15°+ of hip abduction [4], more if tolerated by the infant.

DOSAGE: Use daily as per the infant's tolerance.

WALKING



Use a supportive walker.

INFANTS IN WALKERS: Introduce walking to infants GMFCS III and GMFCS IV, after 10 months of age.

SUPPORTS: Provide support where needed from the head downwards.

HIP POSITION: Aim for active range of motion.

DOSAGE: Use daily as per the infant's tolerance.



CHILDREN: AGES 2-6 YEARS

SUPINE



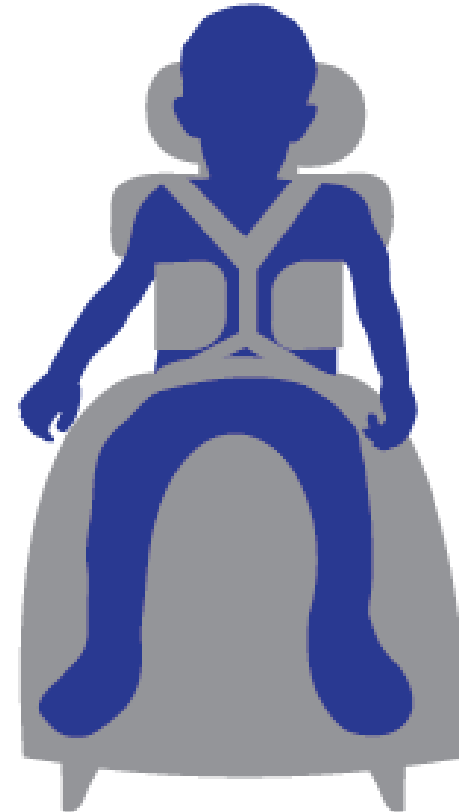
Use positioning pillows, rolls, wedges, padded brackets and positioning devices that hold their shape.

SUPPORTS: Laterally at the pelvis, trunk and head, and trough supports under the thighs and calves. Heels may be free or supported

HIP POSITION: Aim for **hip abduction** 20° [3,5] and hip flexion 0-15° and hip external rotation 5-15°.

DOSAGE: As per the child's tolerance.

SITTING



Continue with sitting equipment. Use positioning equipment such as small seats on tilt or wheeled bases. Gradually bring to more upright position to encourage head control or as head control develops.

SUPPORTS: At the head, trunk, pelvis, thighs and feet. Shape pommels and/or seating system to encourage hip abduction and external rotation and aligned foot position.

HIP POSITION: Aim for **hip abduction** 15-30° [3] as tolerated and hip external rotation 5-10°.

DOSAGE: As required for feeding, fine motor activities, interaction and mobility. **Up to 6 hours per day** [2].

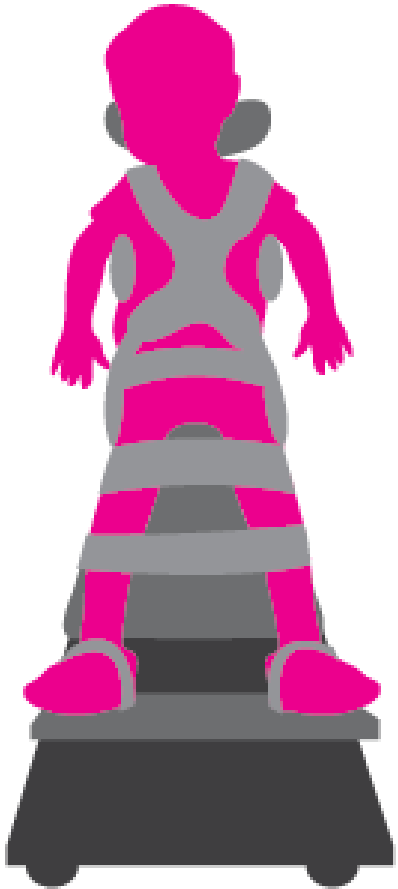


Sunny Hill Children's Hospital – Ages 2-6 Years

www.childdevelopment.ca

http://www.childdevelopment.ca/Libraries/Hip_Health/sunnyhill_clinical_tool_Hip_Health_Full_FINAL.sflb.ashx

STANDING



Continue with standing. Use a supine, prone or upright standing frame.

SUPPORTS: Head, trunk, upper limb (via a tray), pelvic, knee (via straps above and below the knee), pommel and foot. If needed use tilt to provide support and encourage head control.

HIP POSITION: Aim for hip abduction 15-30° [4, 6]. Avoid 0° hip abduction [7].

DOSAGE: Aim for 60-90 minutes per day [3, 5].

WALKING



Use a walker that has support where the child needs it, i.e. head, trunk, pelvis, upper limbs (via a tray or forearm supports).

Continue with supported walking with children GMFCS III and IV. If possible introduce walking with children GMFCS V.

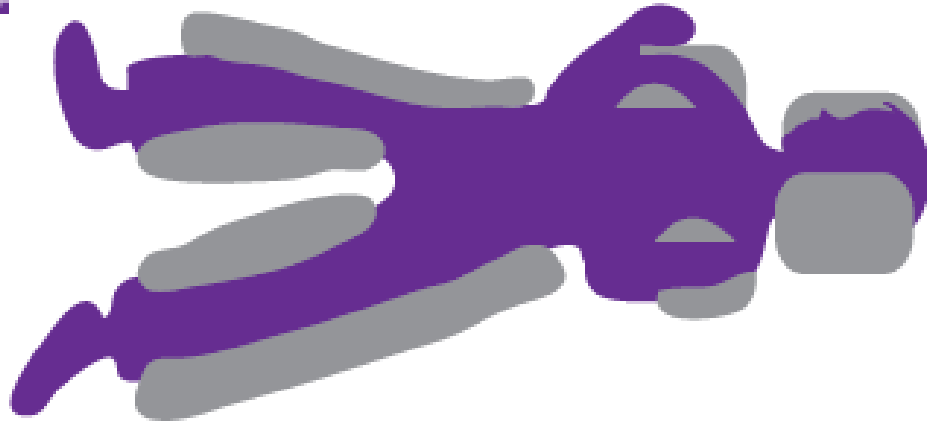
SUPPORTS: Provide support where needed from the head downwards, i.e. head, trunk, pelvis, upper limbs (via tray or forearm supports).

HIP POSITION: Aim for active range of motion.

DOSAGE: As per the child's tolerance.

CHILDREN: AGES 6 TO SKELETAL MATURITY

SUPINE



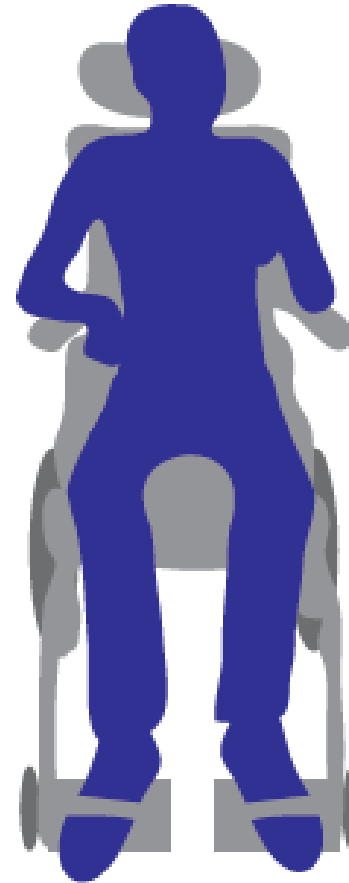
Use positioning pillows, rolls, wedges, padded brackets and/or positioning devices that hold their shape.

SUPPORTS: Laterally at the pelvis, trunk and head, and trough supports under the thighs and calves. Heels may be free or supported

HIP POSITION: Aim for **hip abduction** 20° [5]; hip flexion 0-10°; and hip external rotation 5-15°.

DOSAGE: As per the child's tolerance.

SITTING



Continue with sitting equipment secured on wheeled bases.

SUPPORTS: At the head, trunk, pelvis, thighs and feet. Shape pommel and/or seating system to encourage hip abduction and external rotation and aligned foot position.

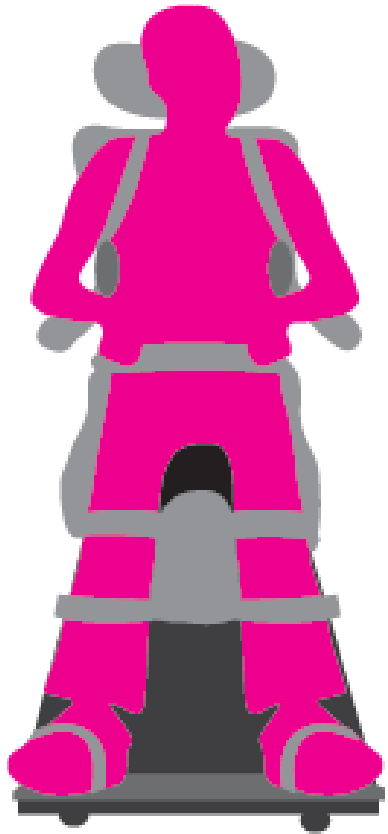
HIP POSITION: Aim for hip abduction 15-30° as tolerated or within available comfortable passive range of movement; and hip external rotation 5-10°.

DOSAGE: As required for feeding, fine motor activities, interaction and mobility.



Age 6 years to Skeletal maturity

STANDING



Continue with standing. Use a supine, prone or upright standing frame.

SUPPORTS: Head, trunk, upper limb via a tray, pelvic, knee (via straps above and below), pommel and foot. If needed use tilt to provide support and encourage head control.

HIP POSITION: Aim for hip abduction 15-30° [6]. Avoid 0° hip abduction [7].

DOSAGE: Recommended daily for 60-90 minutes.

WALKING



Continue with supported walking with children GMFCS III and IV; if possible continue walking with children GMFCS V.

SUPPORTS: Head, trunk, upper limb via a tray, pelvic, knee (via straps above and below), pommel and foot. If needed, use tilt to provide support and encourage head control.

HIP POSITION: Aim for active range of motion.

DOSAGE: As per the child's tolerance.





Tack

