Physiotherapy Management of Children and Young People with Cerebral Palsy Mini Series

Session One: Cerebral palsy; What is it? How does it present? Typical development vs atypical development

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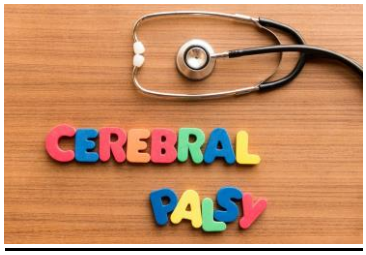

Cerebral Palsy;
What is it? How does it present? Typical vs atypical development

These notes are designed to accompany the presentation recorded on Friday 3rd May 2019.

What is defined as the immature brain and why?

Immature brain is commonly defined as under 24 months old and any brain injury occurring before this age is likely lead to a diagnosis of cerebral palsy.

In the second part of pregnancy (24 weeks +), growth and differentiation events (axonal and ***dendrite growth, synapse formation, and myelination****) as well as stabilization processes (neural cell apoptosis, neurite regression,* ***redundant synapse elimination****) and* ***specialization of circuitry*** *are predominant and persist after birth and are* ***maximal during the first 2 years of life.***

Stroke vs CP? – only difference is age at when lesion to brain occurs. But Fetuses and neonates often have larger infarcts than adults

How prevalent is CP:

1 per 400 children in the UK

McGowan & Vohr (2019) Study of extreme preterm infants less than or equal to 27 weeks' gestation born from 2011 to 2014 and evaluated at 18 months to 26 months of age showed that the rate of CP decreased during this time period from 16% to 12%.5 In addition, whereas the rate of severe CP decreased by 43%, the rate of mild CP increased by 13% during the study period.

Risk factors and casues:

We don't know what causes the CP, it pretty much never occurs in isolation of 1 causal effect and it is incredibly complex.

One of the biggest risk factors for cerebral palsy is being born prematurely (before 36 weeks). Of patients diagnosed with cerebral palsy, 43% of those were born prematurely in UK.

As much as 75% - 80% of cerebral palsy cases are due to injury sustained before birth (prenatal), with less than 10% of cases caused by birth trauma or asphyxia (lack of oxygen). Increased risk of white matter injury between (24 – 36 weeks spastic diplegia) + and grey matter (basal ganglia + brian stem) at full term brain /dyskinetic.
Therefore more children with spastic CP vs ataxia/dyskinesia
Another large risk factor for cerebral palsy is low birth weight (less than 2500g) - Preclampsia + intrauterine growth restriction

Classification/Types of CP:

Muscle tone will reflect the area of injury in the brain, which will discuss a bit more as we progress further.
Ataxic – cerebellum
Spasticity – sensory/motor
Dyskinesia – basal ganglia

It is important to consider that although patients may have a formal diagnosis of one type of cerebral palsy, ***many children present with a mixture of these elements****.*
Incredibly common for the ***patients and families we see to have never heard of many of the terms discussed when see them****.* ***This is common in under 2's as formal diagnosis may change as clinical picture evolves****. Often no formal diagnosis until 18 months/2 year. All the patients we ever treat will present differently from each other and it is important to consider this within our approach and plans for their treatment.*

Diagnosis – No formal test/blood or genetic test. Global picture

Part of the brain injured defines the nature of the movement disorder
PVL most common ischaemic brain injury in children… thus more Spastic CP patients compared with dystonia/Ataxia

11.7% of 351 children with CP had normal MRI findings (Marret 2013)

Majority of patients will be a mixed picture

Spastic CP

Resistance to movement varies on speed and direction of movement

Resistance increases beyond a 'catch' and is velocity dependent. A catch must be present for spasticity diagnosis.

Easy way to explain to patients: ***an over active response to fast stretching of muscles***

Video 1 shows 4 year old with diagnosis of spastic diplegia walking without his splints. Areas of commonly found spasticity and therefore typical representation of 'spastic' gait :

- *increased ankle PF (Gastroc-Soleus)*
- *BL hips int rot (reduced glute strength + adductor tone)*
- *Ant pelvic tilt (trunk weakness + high hip flexor tone)*
- *knees flexed (hamstring spasticity)*

Dystonia

Basal Ganglia – control of voluntary motor movements, learning, cognition and emotion.
Motor function involves sending signals along direct and indirect pathway.

Pure athetosis – writhing at finger toes (Distal)
Choreoathetosis – shoulders, head (Proximal)

Basal Ganglia located next to and works closely with limbic system (helps regulate emotion + behaviour) – Patients with dystonic CP can be very emotional labile (fast mood changes) and emotions impacting upon presentation

Videos 3+4: 23 months old, HIE Grade 3, born on the hard shoulder and blue lighted to hospital – full term when injury suffered (basal ganglia more at risk, now presents with dystonic CP). Note variable tone and involuntary movements during tasks.

Video 5: example of what parent may handover when stressed/excited ('plank' 'stiff as a board' 'pushing back')

Not all hypertonia is spasticity

Ataxia:

Ataxia is rarer in CP, but signs are relatively clear
During gait:
- *stiff/lack of fluidity*
- *wide BOS*
- *incredibly nervous/anxious*

Associated Conditions

Hip migration – CPIPs(cerebral palsy intergrated pathway), developed in scotland, standardised PROM measures
Help prevent unnecessary annual hip x-ray.

Pain – advice on sleep systems, massage, pain relief, active stretching

Cognitive ability – too much information, overload during tasks, dual tasking

Sensory processing disorders – unable to focus, augment sensory information (lycra suit, vibration toys plate, deep pressures…)

Incontinence + constipation common and may cause discomfort or embarrassment

Contractures/Shortening of connective tissue. – orthopaedic intervention.

Typical development
Why don't I say normal development? – as everyone is different, there is no normal. Children with CP are normal children. But often their development isn't typical.

Typical 2 year old who is healthy and active, will have walked close too or more than 1000miles by the time they turn 3. That's an incredible amount of task specific practice that a child with CP is missing out on

Typical children without additional needs all achieve motor milestones at varying times. Understand that there is a large window for achieving independent milestones.

Posture

Initially wide toes out, Penguin
Intoeing 3 year old – Typical. WE DO NOT TREAT
8 years old when presenting with adult gait – feet go on growing to about 16 years

Milestones/Gait

Less than 50% can heel strike when walking (<18 months)
80% can run by 18 months
Why is BOS narrower at 2-3 years old? – femoral anteversion

1st video
- *playing waterpark*
- *bit flat footed/min DF*
- *COG more controlled*
- *wide turning circle*

2nd video
- *More complex motor tasks + dual tasking*
- *improved balance*
- *tighter turning*
- *more control over LL joints*
- *increased speed with control*

Variance on exposure to exercise and whether challenged with more challenging tasks define how competent children are at tasks.

Assessment

Subjective

Child + Parental concerns – often have never had CP explained to them, or why present the way they do.
PMH – Orthopaedic intervention: de-rotaional osteotomy, epilepsy?
Birth + developmental Hx – birth trauma? Prem? Milestones?
Drug history: anti-spasmodics (baclofen, botox, gabapentin, CBD)
Current provision – collaborative working (GET CONTACT DETAILS), current equipment provision (appropriate? Being used? Explained what its for?)

Objective

ROM/Power/Tone – will not always be appropriate or possible to test all joints – kid moving about/type of CP/functional ability
focus on areas of interest – for Spastic CP: DF ROM, POP angle, L=R with hip ROM (int/ext ROM)
Symmetry – trendelenburg? Bias? Using both sides (bi-manual)?
Able/unable to perform tasks?
Quality does not = function. Initially don't mind how a patient is moving, can improve on that with Rx. Is it safe, can they achieve task?
Make note of how moving around, is the child 'fixing'? Are they aware of surroundings/floor? Motor planning

Fatigue important to manage – will impact on Ax and Rx. True representation of child – after school? Early in day?

Video 11
AFOs and lycra suit in situ, 2 years later from earlier video.

Look at static stability – initiation of movement

Top down

Awareness of surroundings? – moves sideways to avoid chair and toy
Trunk/COG – forward (many children struggle with controlling speed, rely on momentum for balance)
UL – guarding/fixing
Trunk/pelvis – rotation? Fluidity?
BOS – narrower, but still a bit of increased postural sway or lateral weight shift (due to stiff trunk)
Knee and hip flexion – increased but still reduced compared to typical
Stomp – using that large feedback, more feedback with end ROM
Stopping? – is capable, but unlikely from that viewing

Break this down as complicated as we like – simple – supervised walking, with high guard, trunk fixing and high gait speed. Is this enough for a handover to another therapist?

Assssment gold

Many of families you will be seeing will have had their brains melted by numerous consultants and other medical professionals. During your Ax you will gain an insight to what families/children actually understand about CP and their presentation. So shut up and listen to what they are saying.

Make your Ax functional. Challenge your patient in functional ways. Children's job is too play, challenge them within the session in a manner they may play (have races, climb over equipment, throw stuff around…etc.) Parents are interested in functional gains that will benefit their childs future, ***assess function!***

Handling: get your hands off. ***Hardest thing to do as a new therapist.*** *Child will always accept support. Takes time, but knowing when to offer facilitation or where to position yourself can make difference between independence (ataxic/sensory processing/visually impaired)*

Proximal – distal. If a child can't control their trunk or head, I couldn't care less what they are doing at their ankles. Keep it functional and relevant to the patient.

Communication

Speak to the child/patient. They are children, not morons and you will never build a rapport with a child if you spend most of your time talking with a caregiver or family member. ***Especially important if visually impaired or other senses.***

- *figure out they are communicating and* ***DOCUMENT***

Toys/games – find out what games they like to play and ***document*** *this. Goldust for handover, shows an interest, helps build rapport (remembering fav toy/cartoon)*

Role of Physio

If you understand what CP is and why you're performing certain aspects of your Ax/Rx, but you're unable to explain it; ***PRACTICE.***
If you're unable to educate your patients and communicate in simple terms then you will not be a good physio. It's a skill and it takes time to develop, so practice

Kids job is to play and we can help access worlds either by signposting towards services/sports clubs/events. We can advise teams or sports clubs in how to incorporate our patients more easily. We are often first point of contact for everything – orthotic issues, orthopaedic questions, medicine….

EHCP and formal reports. Your opinion and formal reports have a profound impact on a childs access to therapies and support at school. If you do not suggest goals or recommend a child participates in therapy at school, no time will be allocated for this. Fight to ensure your patients receive as much input as possible and GET OUT OF THEIR W/CHAIRS!

Make use of MDT members. You will be asked a million questions by families and if you have close ties to other team members, use their knowledge or pass them on.
You are nearly always first point of contact for issues relating to your patients medical issues.

Be aware of how important your role is within a patient families life is. You can have an incredibly positive impact on these childrens futures and you can inspire confidence.

Peadiatric survival skills

Treating and delivering therapy to children is easy. As long as you realise your job is 90% clown and 10% physio, you'll be absolutely gold. The challenge is managing parents. They're often terrified and have minimal understanding of their childs condition and what the future holds for their child, so before getting annoyed at the million questions put yourself in their shoes.

Educate them on what is happening, why it is happening and explain the role of therapy.

Empower the families to deliver care for their children. As awesome as we are, we are not the over-riding force that is going to impact on these childrens lives. You may be fortunate enough like myself to see a patient once a week, or we may only see a patient once every few months. Either way, we must encourage our patient families to take ownership of their rehab and engage with the therapy.

Physios are the best humans on the planet, but we aren't superheroes. Paeds can be overwhelming, Switch off, we're not wholly responsible for a childs progress, can only offer tools and education for families/patients.

Keep it simple – people overcomplicate brain injury all the time. Once you understand the hardest part is building a rapport, then physio is easy. Treat what you see. If weak – strengthen, if something hard – practice it. High tone – use it (strengthen to lengthen)