THE LATE EFFECTS OF POLIO

Current Research in Post-Polio Syndrome

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May 23, 2010

Orange County Post Polio
Support Group

While Looking for the Address of Today's Meeting, I Happened to Notice on the PP OC Website

- Are we getting closer to being able to predict which polio survivors will have PPS?
- If embryonic cell therapy works on ALS victims, should it also work on polio survivors with PPS?

- We will try to address these questions and more. In a nutshell, the answers are yes, but what are the questions really asking?

No Bad News This Year

- There are 20 active studies of polio listed in ClinicalTrials.gov. 19 have to do with vaccination, but the other one is looking at brain fatigue.

- There was no new post-polio research presented at the American Academy of Neurology meeting in Toronto last month, but there was one lecture.

Clinical Trials

- **Study of Mental Fatigue in Polio Survivors**
- **This study is currently recruiting participants.**
- **Verified by Uniformed Services University of the Health Sciences, March 2007**
- **First Received: June 14, 2007   Last Updated: June 15, 2007**
- **Sponsored by: Uniformed Services University of the Health Sciences**
  Information provided by: Uniformed Services University of the Health Sciences
- **ClinicalTrials.gov Identifier:** NCT00487487

- **Post-Poliomyelitis** Syndrome (PPS) is the term describing the new problems affecting **polio** survivors many years after recovery from paralytic **polio**.
- Among the symptoms, fatigue is one of the most frequent and debilitating. In addition to physical incapacitation, the fatigue of PPS also affects mental function. The term "brain fatigue" is usually used by patients to express problems on the areas of attention, concentration, memory and clear thinking.
- Unfortunately, little is known about cognitive fatigue of PPS patients. This study is meant to examine if mental impairment is present in PPS patients and, if so, how it interferes on the self-function of patients. Patients will undergo an interview, clinical and neurological evaluation, and a battery of screening laboratory tests to make sure they are eligible for the study. Patients who qualify will undergo neuropsychometric tests in order to assay performance in the main areas of cognitive functioning. Through this organized approach we expect to be able to determine if mental fatigue is a significant problem affecting **polio** survivors, what areas are most affected, and how it may interfere with daily living.

Registry for Polio Survivors

- **https://www.conemaugh.org/apps/postpolio/**

- **The John P. Murtha Neuroscience and Pain Institute, Johnstown, Pennsylvania, launched an online registry of polio survivors to promote research about the late effects of polio and post-polio syndrome.**

  5-10 minutes of on-line questions

  Your identity is kept confidential

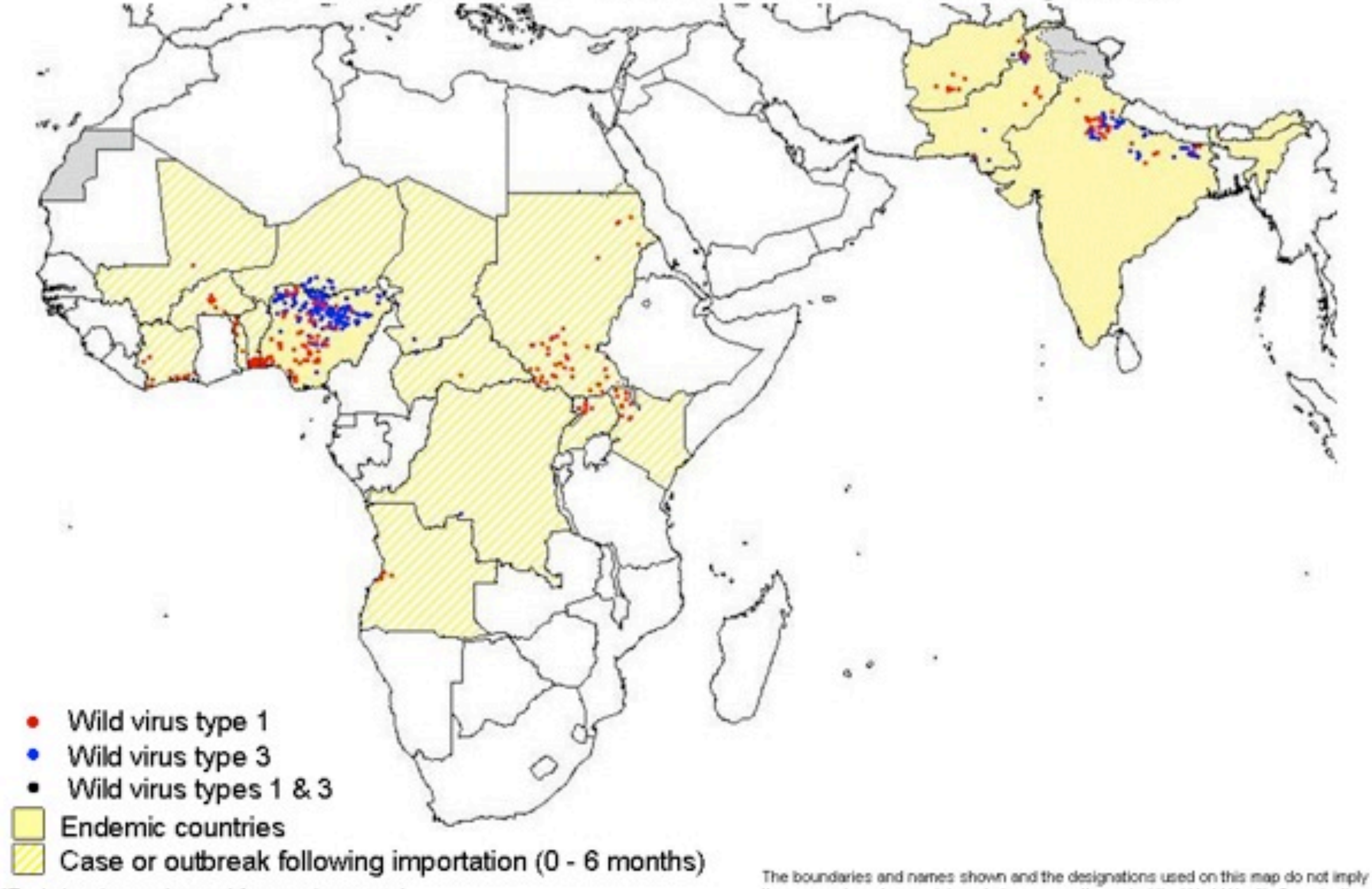
American Academy of Neurology Meeting April 2010

- **Global Health Challenges: Neurology in Developing Countries**

  Gregory D. Cascino, MD, FAAN

  Program Description:
  The neurologic disorders in developing countries include HIV/AIDS, multidrug-resistant tuberculosis, meningitis, malaria, and nutritional deficiencies. The socioeconomic impact in selected areas, such as sub-Saharan Africa, has been catastrophic because these illnesses may affect children, working adults, and health care professionals. Approximately 95% of the world's estimated 40 million HIV/AIDS patients are in developing countries. The global challenges include providing proper diagnostic studies and medical treatments at an affordable cost. The US government and private citizens provide nearly $40 billion annually to developing countries for medical care. Vaccinations are necessary to prevent neurologic diseases such as tetanus and polio. Political issues and lack of local resources and personnel are important obstacles to quality care.

Wild Poliovirus*, 13 Nov 2008 – 12 May 2009



*Excludes viruses detected from environmental surveillance and vaccine derived polioviruses

Data in WHO HQ as of 12 May 2009

Global Polio Eradication Initiative

as of April 2010 http://www.polioeradication.org/casecount.asp

- In Nigeria, Muslim leaders in the north — who had allowed the disease to spread by halting polio vaccinations in 2003-4, based on rumors that the drops were part of a Western plot to sterilize Muslim girls or spread the AIDS virus — now embrace the cause as their own. So far this year, only two children have been paralyzed by wild polio virus in Nigeria, compared with 123 during the same period last year, according to Nigerian and international health officials.
- And in India, Uttar Pradesh and Bihar — states that seemed unable to vanquish polio no matter how many times they vaccinated children — for the first time have not had a single case caused by the most virulent polio viral type for four months straight, World Health Organization officials said.
- Globally, the number of new polio cases registered so far this year is down to 56 — a 75 percent drop from the same period last year, the W.H.O. said.
- “We’ve never had so many things looking so positive across so many areas,” said Dr. Bruce Aylward, director of the polio eradication drive for W.H.O.
- But eradication is not expected before 2012.

Post-Polio Health International sponsored research

- **PHI received six Phase 1 applications for its next award to be given in late 2010. The submissions, from Brazil, Israel, United States and Sweden, will be reviewed by an expert panel that includes polio survivors to determine which requests will be asked to submit Phase 2 requirements.**

- **THE FIFTH AWARD** (2009)
  PHI awarded $25,000 to team from University of Insubria, Varese, Italy, led by Antonio Toniolo, MD, PhD, Professor of Medical Microbiology and Virology. The study, **Persisting Noninfectious Fragments of Poliovirus in PPS Patients: Virus Detection and Susceptibility to Antiviral Drugs,** will complete the sequencing of the genome of persistent fragments of poliovirus strains and compare them to wild-type polioviruses.

- **THE FOURTH AWARD** (2007)
  PHI Grant Awarded to team at University of Arkansas for Medical Sciences (UAMS) for **Pilot Study to Identify PPS Biomarker.** The researchers propose to determine whether there is a unique signature, or disease biomarker, in the immune system of individuals with post-polio syndrome (PPS) that would enable a more definitive diagnosis of PPS.

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- Final report

- The data indicate that low level PV activity can persist for decades in most polio survivors.
- The results however do not provide a pathogenetic link of PV persistence with the development of PPS.
- Further characterization of these PV strains and their role in PPS is underway.
- Testing of novel anti-viral compounds aimed at eliminating these mutated and persisting PV strains will follow.

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- Final report

- Post polio individuals have higher levels of antibodies and regulatory Tcells circulating in their blood than healthy age-matched controls.
- Stable polio individuals have variable intermediate levels.

- A larger prospective study of stable polio individuals may help establish these blood markers as indicators of post polio or possibly of those at risk for post polio.

More Good News

Post-Polio continues to be in the news:

- February 3, 2010 edition of the New York Times
- By Kirk Johnson out of Salt Lake City

- For Some Survivors, Polio Won't Fade Into the Past
- Becky Lloyd, a researcher at the American West Center of the University of Utah, started an oral history project on polio last fall. She imagined weaving a tapestry of memory — a filling in of details about quarantines and rehabilitation units and hospital wards, with their rows of iron-lung breathing machines that became the most chilling symbols of the disease's attack.
- But Ms. Lloyd soon found that polio's past was not dead and gone. It was not even past. In all the early interviews, people talked about an after-echo legacy of the disease called post-polio syndrome that had come back to hit them in their 60s and 70s. Survivors who had battled through braces and operations decades ago wanted to talk about the present, Ms. Lloyd said, and the new battlefield they faced.
- "Thirty, 40 or 50 years later, it's like they're getting the disease again,"

Last Year:
PPHI 10th International Conference at Warm Springs
“Living with Polio in the 21st Century”
This Year:

POST POLIO SYNDROME
– a challenge of today

WHY THE NEED TO INCREASE AWARENESS?

- Polio survivors report poorer functional status and health-related quality of life, than non-polios.
- The life-altering effects of PPMA have not been adequately addressed by health care providers.
- Many publications indicate that polio survivors are best served in multidisciplinary clinics staffed by knowledgeable professionals.

I Believe the Standard Guidelines Still Hold

- **Make sure your symptoms are polio related and not due to other neurologic, orthopedic, or medical/ medicine issues.**
- **Use Rehab to develop a program of appropriate non-fatiguing exercise and reconditioning, assistive devices, pacing, and finding your limit.**
- **Do not push past the limit of pain and fatigue.**
- **No one is talking "Conserve to Preserve".**
- **Everyone needs a good PCMD, knowledgeable PT, and attention to good general health (weight control, exercise, assistive devices, relaxation training, sleep hygiene, emotional health).**

But I Have No Idea Whether Health Care Reform Will Make Them Achievable

- I just saw typical polio survivor with PPS back in clinic after a 2 year hiatus.

- Two years ago we recommended PT to develop a non-fatiguing home ex program.
- We also recommended a sleep study for probably obstructive sleep apnea contributing to daytime fatigue.

- Two years ago her HMO approved PT for treatment of carpal tunnel only. No HEP.
- She did get a sleep study confirming OSA. The physician in charge counseled her that the CPAP mask would be very uncomfortable and could take a year to get used to. She chose not to try it.
- A perfect storm of rationing and misinformation.
- But, she came back to us with the same complaints and a new HMO.
- Will it work this time?

We Need More Recognized Guidelines for Treatment as well as Diagnosis

- **Prescribing Exercise for Common Conditions**
- **Exercising With Polio or Post-Polio Syndrome: Prescription for Health**
- American College of Sports Medicine
- Posted: 04/14/2010
- www.exerciseismedicine.org
- I have printed the article for the group.

- Let's also remember the widely reprinted March of Dimes guidelines from the 2000 Warm Springs meeting.
- http://www.marchofdimes.com/files/PPSreport.pdf

New Publications

- **In the past 12 months there have been 31 new publications about post polio in the medical literature—**
  - **6 review articles of post-polio syndrome**
  - **2 dealing with natural history**
  - **6 dealing with quality of life**
  - **11 dealing with treatment issues**
    - **2 with fatigue**
    - **3 with pain**
    - **2 with swallowing**
    - **1 each with breathing, sleep, exercise, orthotics**

6 dealing with orthopedic surgeries

Natural History

- Arch Phys Med Rehabil. 2010 Apr;91(4):523-8.
- **The impact of age and comorbidity on the progression of disability in late-onset sequelae of poliomyelitis.**
- Stolwijk-Swüste JM, Tersteeg I, Beelen A, Lankhorst GJ, Nollet F; CARPA Study Group.
- Collaborators (9) Stolwijk-Swüste JM, Beelen A, Nollet F, Lankhorst GJ, Dekker J, van Dijk GM, Post B, de Haan RJ, Speelman H.Department of Rehabilitation Medicine, Vrije Universiteit University Medical Center, 1007 MB Amsterdam, The Netherlands. j.stolwijk@rcamsterdam.nl
- **Abstract**
- OBJECTIVES: To describe the functional course over 5 years in patients aged 45 to 85 years with late-onset sequelae of poliomyelitis (LOSP) and to explore the impact of age and comorbidity.
- DESIGN: Prospective cohort study with 5 measurements over 5 years.
- SETTING: University hospital.
- PARTICIPANTS: Subjects with LOSP (N=168). INTERVENTIONS: Not applicable.
- MAIN OUTCOME MEASURES: FIM, Medical Outcomes Study 36-Item Short Form health survey for physical functioning subscale (SF-36-PF), walking test, isokinetic quadriceps strength, and cumulative illness rating scale (CIRS) for comorbidity.
- RESULTS: The FIM score (mean baseline +/- SD, 121+/-4) and SF-36-PF (mean baseline +/- SD, 39.5+/-24) decreased 2.2 and 3.7 points, respectively, over 5 years independent of age. The distance walked in 2 minutes (mean baseline +/- SD, 126.2+/-34m) decreased 4.5m, quadriceps strength (mean baseline +/- SD, 88.0+/-42.2Nm) declined 7Nm (8%), and CIRS (median baseline=6; range, 0-21) increased 1.5 points. A higher CIRS score was correlated with a lower FIM score and faster decrease in the FIM. A longitudinal model of factors associated with the FIM included sex, age, leg strength sum-score, arm strength sum-score, and CIRS score. The interaction of CIRS and leg strength sum-score with follow-up time was significant. A model of factors associated with SF-36-PF included sex, age, leg strength sum-score, and CIRS score.
- CONCLUSIONS: Despite a reduction in muscle strength, disability increased little in patients with LOSP. Increased age and comorbidity has a negative effect on disability. Comorbidity and the severity of leg paresis affected the course of functional independence but not the course of perceived physical functioning.

Quality of Life

- J Rehabil Med. 2010 Apr;42(4):377-9.
- **Quality of life and health conditions reported from two post-polio clinics in Israel.**
- Jacob T, Shapira A.
- Physical Therapy Department, Ariel University Center of Samaria, Ariel, Israel. tamar@ariel.ac.il
- **Abstract**
- OBJECTIVE: To evaluate the perceptions of health and quality of life among a group of polio survivors in Israel and to identify potential activities for improving their quality of life.
- DESIGN: An observational study.
- SUBJECTS: The sample consisted of 101 polio survivors who sought treatment at 2 post-polio clinics in Israel. The majority of participants were between the ages of 45 and 65 years, and approximately 25% were wheelchair-bound.
- METHODS: Participants were invited to attend a seminar, where they were invited to complete a questionnaire on demographic variables, mobility, perceptions of and satisfaction with health status and quality of life, and the potential contribution of 16 activities to improve their quality of life.
- RESULTS: Participants had low physical scores and normative mental scores. Mean scores on the Short-Form-12 questionnaire for physical and mental components were 32.9 and 50.3, respectively. Approximately 70% expressed the belief that exposure to up-to-date information about post-polio, as well as participation in social activities, might improve their quality of life.
- CONCLUSION: Information about the physical and mental components of polio survivors, as well as the desire to partake in specific activities for polio survivors, may serve as a basis for the operations and prioritization of service providers.

Fatigue

- Fatigue in post-poliomyelitis syndrome: association with disease-related, behavioral, and psychosocial factors.
- Trojan DA, Arnold DL, Shapiro S, Bar-Or A, Robinson A, Le Cruguel JP, Narayanan S, Tartaglia MC, Caramanos Z, Da Costa D.
- PM R. 2009 May;1(5):442-9

- **OBJECTIVE: To determine the biopsychosocial correlates of general, physical, and mental fatigue in patients with postpoliomyelitis syndrome (PPS) by assessing the additional contribution of potentially modifiable factors after accounting for important nonmodifiable disease-related factors. It was hypothesized that disease-related, behavioral, and psychosocial factors would contribute in different ways to general, physical, and mental fatigue in PPS and that a portion of fatigue would be determined by potentially modifiable factors.**
- **DESIGN: Cross-sectional study.**
- **SETTING: A tertiary university-affiliated hospital post-polio clinic.**
- **PATIENTS: Fifty-two ambulatory patients with PPS who were not severely depressed were included.**
- **ASSESSMENT OF RISK FACTORS: Potential correlates for fatigue included disease-related factors (acute polio weakness, time since acute polio, PPS duration, muscle strength, pain, forced vital capacity, maximum inspiratory pressure, maximum expiratory pressure, body mass index, disability, fibromyalgia), behavioral factors (physical activity, sleep quality), and psychosocial factors (depression, stress, self-efficacy).**
- **MAIN OUTCOME MEASUREMENTS: Fatigue was assessed with the Multidimensional Fatigue Inventory (MFI; assesses fatigue on 5 subscales) and the Fatigue Severity Scale (FSS).**

- RESULTS: Multivariate models were computed for MFI General, Physical, and Mental Fatigue. Age-adjusted multivariate models with nonmodifiable factors included the following predictors of
- (1) MFI General Fatigue: maximum inspiratory pressure, fibromyalgia, muscle strength;
- (2) MFI Physical Fatigue: maximum expiratory pressure, muscle strength, age, time since acute polio; and
- (3) MFI Mental Fatigue: none.

- The following potentially modifiable predictors made an additional contribution to the models:
- (1) MFI General Fatigue: stress, depression;
- (2) MFI Physical Fatigue: physical activity, pain; and
- (3) MFI Mental Fatigue: stress.

- CONCLUSIONS: PPS fatigue is multidimensional. Different types of fatigue are determined by different variables. Potentially modifiable factors account for a portion of fatigue in PPS.

Fatigue Management

- **Development, standardisation and pilot testing of an online fatigue self-management program.**
- **Ghahari S, Packer TL, Passmore AE.**
- **Disabil Rehabil. 2009 May 19:1-11. [Epub ahead of print]**

How much was due to the activities and how much to the support model?

- Purpose. Although an effective face-to-face fatigue program is available, people with transportation, time or geographic restrictions cannot access this intervention. Therefore, the aim of this study was to develop and to evaluate effectiveness of an online fatigue self-management program (online FSMP).
- Methods. Key features of the face-to-face program were captured and transferred to an online FSMP prototype. Subsequently, three pilot tests were conducted for formative evaluation of the program and necessary changes were made to improve the program. During the third pilot test, the effectiveness of the online FSMP was also tested using a pre-test post-test design on a sample of individuals with multiple sclerosis, Parkinson's disease or post-polio syndrome.
- Results. The study resulted in a standardised 7-week online FSMP mimicking its face-to-face version. Participants were offered fatigue self-management skills through structured activities, sharing information and experiences, expressing their ideas or feelings and offering advice and support to one another.
- The participants in the third pilot study improved significantly on the Fatigue Impact Scale ($p < 0.05$) and a trend toward significance was shown on the Personal Wellbeing index ($p = 0.08$).
- Conclusions. The online FSMP is a viable treatment for people with neurological conditions and warrants further study.

Review of Treatment Trials for Fatigue

- **[Treatment on fatigue of patients with postpolio syndrome. A systematic review]**
- [Article in Spanish]
- Aguila-Maturana AM, Alegre-De Miquel C.
- Rev Neurol. 2010 May 16;50(10):595-602.

INTRODUCTION: Fatigue is the most common symptom and the most disabling in patients with post-polio syndrome.

AIM: To analyze the effectiveness of various treatments used to improve fatigue syndrome patients post-polio.

MATERIALS AND METHODS: Systematic review. Is defined a bibliographic search strategy in Medline (from 1961), EMBASE (from 1980), ISI Web of Knowledge and Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), AMED (January 1985), EMI and Physiotherapy Evidence Database (PEDro) until February 2008, the population defined (post-polio syndrome patients) and intervention (any treatment for fatigue in these patients). Outcome were selected as different scales of fatigue and fatigue or vitality dimension scales quality of life. Clinical trials were selected.

RESULTS: We retrieved 396 articles, of which 23 were analyzed in detail. Finally, 19 were included in the analysis, a total of 705 patients.

CONCLUSIONS: Lamotrigine, bromocriptine, aerobics and flexibility exercises, hydrokinesitherapy and technical aids are treatment techniques that reduce more fatigue in these patients.

Exercise—proposed new trial

- BMC Neurol. 2010 Jan 18;10:8.
- **Exercise therapy and cognitive behavioural therapy to improve fatigue, daily activity performance and quality of life in postpoliomyelitis syndrome: the protocol of the FACTS-2-PPS trial.**
- Koopman FS, Beelen A, Gerrits KH, Bleijenberg G, Abma TA, de Visser M, Nollet F.
- Department of Rehabilitation, Academic Medical Centre, University of Amsterdam, Amsterdam, The Netherlands. S.Koopman@amc.uva.nl
- **Abstract**
- BACKGROUND: Postpoliomyelitis Syndrome (PPS) is a complex of late onset neuromuscular symptoms with new or increased muscle weakness and muscle fatigability as key symptoms. Main clinical complaints are severe fatigue, deterioration in functional abilities and health related quality of life. Rehabilitation management is the mainstay of treatment. Two different therapeutic interventions may be prescribed (1) exercise therapy or (2) cognitive behavioural therapy (CBT). However, the evidence on the effectiveness of both interventions is limited. The primary aim of the FACTS-2-PPS trial is to study the efficacy of exercise therapy and CBT for reducing fatigue and improving activities and quality of life in patients with PPS. Additionally, the working mechanisms, patients' and therapists' expectations of and experiences with both interventions and cost-effectiveness will be evaluated.
- METHODS/DESIGN: A multi-centre, single-blinded, randomized controlled trial will be conducted. A sample of 81 severely fatigued patients with PPS will be recruited from 3 different university hospitals and their affiliate rehabilitation centres. Patients will be randomized to one of three groups i.e. (1) exercise therapy + usual care, (2) CBT + usual care, (3) usual care. At baseline, immediately post-intervention and at 3- and 6-months follow-up, fatigue, activities, quality of life and secondary outcomes will be assessed. Costs will be based on a cost questionnaire, and statistical analyses on GEE (generalized estimated equations). Analysis will also consider mechanisms of change during therapy. A responsive evaluation will be conducted to monitor the implementation process and to investigate the perspectives of patients and therapists on both interventions.
- DISCUSSION: A major strength of the FACTS-2-PPS study is the use of a mixed methods design in which a responsive and economic evaluation runs parallel to the trial. The results of this study will generate new evidence for the rehabilitation treatment of persons with PPS.

Use of Orthotics especially for the knee

- Ann Phys Rehabil Med. 2010 Feb;53(1):51-9. Epub 2009 Dec 9.
- **Orthotic devices and gait in polio patients.**
- Genêt F, Schnitzler A, Mathieu S, Autret K, Théfenne L, Dizien O, Maldjian A.
- hôpital maritime de Berck, Garches, France. francois.genet@rpc.aphp.fr
- **Abstract**
- Polio survivors are aging and facing multiple pathologies. With age, walking becomes more difficult, partly due to locomotor deficits but also as a result of weight gain, osteoarticular degeneration, pain, cardiorespiratory problems or even post polio syndrome (PPS). These additional complications increase the risk of falls in this population where the risk of fractures is already quite high. The key joint is the knee. The muscles stabilizing this joint are often weak and patients develop compensatory gait strategies, which could be harmful to the locomotor system at medium or long term. Classically, knee recurvatum is used to lock the knee during weight bearing; however, if it exceeds 10 degrees , the knee becomes unstable and walking is unsafe. Thus, regular medical monitoring is necessary. Orthoses play an important role in the therapeutic care of polio survivors. The aim is usually to secure the knee, preventing excessive recurvatum while respecting the patient's own gait.
- Orthoses must be light and pressure-free if they are to be tolerated and therefore effective. Other joints present fewer problems and orthoses are rarely indicated just for them.
- The main issue lies in the prior evaluation of treatments' impact. Some deformities may be helpful for the patients' gait and, therefore, corrections may worsen their gait, especially if a realignment of segments is attempted. It is therefore essential to carefully pre-assess any change brought to the orthoses as well as proper indications for corrective surgery. In addition, it is essential for the patient to be monitored by a specialized team.

Pain

- J Neurol. 2010 Mar 30. [Epub ahead of print]
- **Analysis of long-standing nociceptive and neuropathic pain in patients with post-polio syndrome.**
- Werhagen L, Borg K.
- Division of Rehabilitation Medicine, Department of Clinical Sciences, Karolinska Institutet Danderyds Hospital, Stockholm, Sweden, lars.werhagen@ki.se.
- **Abstract**
- The purpose of this study was to analyze pain, both nociceptive and neuropathic, in patients with post-polio syndrome (PPS) and relate the pain to age at the initial polio infection, age at examination, to gender and disability. The study was conducted in a university hospital department.
- Patients with PPS were interviewed at their regular visits about pain, its character, intensity and localization. A clinical examination, including a thorough neurological examination, was performed. Data included age at time of polio infection, age at time of examination and gender. Pain intensity was measured with the VAS-scale and walking capability by the WISCI-scale.
- One hundred sixty-three (88 women, 75 men) patients were included in the study. Pain was present in 109 (67%). Pain was more frequently reported by women (82%) than by men (49%). 96 patients experienced nociceptive pain, 10 patients both neuropathic and nociceptive pain and three experienced pure neuropathic pain. Half of the patients with pain experienced pain in more than one body region.
- When neuropathic pain was present, another additional neurological disorder was diagnosed.
- Pain was more often found in younger patients (around 70%) than in older patients (around 50%).

- In summary pain is common in patients with PPS and most patients experienced nociceptive pain. Women have pain more often than men. Older patients experience pain more seldom than younger patients. Age at time of primary polio infection is important for the development of pain. When neuropathic pain is present, it is important to proceed with neurological examination to find an adequate diagnosis.

WHAT WE ALREADY KNOW

- **New symptoms in a polio survivor are PPS only about 1/3 of the time.**
- **New symptoms may be due to another medical or neurological illness or to orthopedic problems, which must be identified and treated.**
- **Treatment of other illnesses in a polio survivor must be monitored relative to the sensitivities of PPS (eg. surgery, chemotherapy, use of cholesterol lowering medication).**
- **Polio survivors with symptoms of PPS must take care to modify lifestyle; avoid overuse; use assistive devices and bracing if appropriate; control weight gain, sleep problems, stress, and pain; and engage in non-fatiguing exercise for strength and conditioning. Many studies have shown that success in these areas can halt progression of PPS symptoms and promote improvement of 1-2% per year.**

Resources

WWW.POST-POLIO.ORG

WWW.NCBI.NLM.NIH.GOV/ENTREZ (PUBMED)

WWW.CLINICALTRIALS.GOV