An interdisciplinary modular program for Post Polio Patients at the Catholic Clinic Koblenz

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1:1000 paralytic process of Poliomyelitis acuta anterior

Virus infection of motoric anterior horn cells of the spinal cord in each level
### Increasing number of cases Polio ICD B91G, G14

**Analysis: Post-Polio-Patients**

**Department: Konservative Orthopädie und Polio-Zentrum**

<table>
<thead>
<tr>
<th>Jahr</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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<tbody>
<tr>
<td>Post-Polio-Fälle</td>
<td>81</td>
<td>172</td>
<td>285</td>
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#### Zentrum

**01. Januar bis 31. Dezember 2012**

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**Gesamtjahr 2013 (Faktor 11,8)**

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| Gesamt | 336 | 508 |

- **Jahr 2009**: 81 Fälle
- **Jahr 2010**: 172 Fälle
- **Jahr 2011**: 285 Fälle
2014: Consequences of Poliomyelitis acuta anterior

70,000 Polio patients in Germany between the age of 16 and 86 with handicaps affecting:
- Sitting, breathing, sleeping
- Standing, walking, running
- Including pain and loss of muscular function
- Consequences of downfall, abuse of joints
Post-Polio Syndrom
Status 2014

- Up to 70% probable secondary disease 15-50 years after Polio (Halstead criteria)
- Inescapable consequence of whole-body paralysis
- Lack of reference books leads to lack of knowledge
Past Medical Treatment

**Iron Lung** - a sealed chamber with an electrically driven bellows that regulates breathing.

**Rigid Braces** – no joint function

**Body Casts** – also today for growing up polios, no trunk movement

but

**Functional Treatments of Polio Survivors**
Treatment options for Polio patients at the Polio Center, Koblenz

FKoopmann, K Uegaki, N E Gilhus, A Beelen, M de Visser, F Nollet
Treatment for postpolio syndrome
Cochrane Database Syst Rev 2011

1. Physiotherapy and functional training only based on a performance test
2. Respiration devices only after clinical diagnostics of pulmonary function under stress and during sleep
3. Surgical joint replacement using special implants
4. Pain therapy based on specific drugs for verified Polio sequela
5. Consultancy after verified examination of Polio stadium
Stationary diagnosis- and treatment concept by polio remote damages

**Modul 1** (extended stationary diagnostic and therapy)
- Neurology, Neurophysiology
- Videogaitcontrol, Orthotic testing
- Myelography, Biopsy, etc.
- z.B. OPS 3-130 8-563.1
- Bodyplethysmography, Sleepscreening
  - OPS 1-790 1-715

**Modul 2**
- Invasive Paintherapy
- Endoprothetic p.e. OPS 5-820.2
- Arthroskopie (MIC) Spine Surgery
- Traumatology
- Sleeplabor/Wearing test

**Modul 3**
- Inhouse
- Orthoticeducation
- Reconditioning
- p.e. OPS 8-559.32 (30 Therapies/week, 7-13 days
- OPS 8-91

**Modul A**
- Conservative Orthopedic Department/Polio Center
  - p.e. OPS 3-806 MRT
  - OPS 1-205 EMG
  - OPS 1-209 „Spina bifida diagnostic“

**Modul 4**
- Orthopedic/Neurologic Rehabilitation clinic
  - (Certificated by BV Polio e.V.)

**First- and Control Examination in Polio Ambulance**
Isokinetik power/weakness analysis in Polios and PPS

Sunnerhagen, K., Sahlgrenska University, (2014) Gothenburg, Sweden, strength peak in 60° knee flexion, 60°/s isometric endurance 40% of peak
Isokinetic power/weakness analysis in Polios and PPS

Developing of strength measurement knee extension/flexion from female, 58y, PPS V (NRH Classif.) 11/2012 - 06/2014
We therefore conclude that moderate intensity strength training is safe and effective in post-polio patients."


**RANDOMIZED CONTROLLED TRIAL OF STRENGTH TRAINING IN POST-POLIO PATIENTS**

K. MING CHAN, MD, FRCP,1, 2, 3 NASIM AMIRJANI, MD,2 MAE SUMRAIN, BSc,2 ANITA CLARKE, BSc,3 and FAY J. STROHSCHEN, BSc2

1 Division of Physical Medicine and Rehabilitation, Faculty of Medicine, 513 Heritage Medical Research Center, University of Alberta, Edmonton, Alberta T6G 2S2, Canada

2 Centre for Neuroscience, Faculty of Medicine, University of Alberta, Edmonton, Alberta, Canada

3 Post-Polio Clinic, Faculty of Medicine, University of Alberta, Edmonton, Alberta, Canada

**Trunk instability of PPS and invigoration of back**

- Physiotherapy with controlled, individual resistance with therapy monitoring
- Function gym to invigoration after staged proving for repetition
- Medical training therapy with an 2-dimensional bounded strength training machine, is so PC based, isokinetic, after strength testing
Common scientific knowledge in **PPS treatment makes clear the need of permanent physiotherapy.**

a. Physiotherapy for balancing the muscular dysbalances and receipt of abilities

   KG Zn2a 30 minutes, 1-2 x/ Week

   Lit.: Orientierungshilfe zur Diagnostik und Therapie bei Patienten mit Poliofolgen und Post-Polio-Syndrom 2010 ISBN 978-3-9804519-9-4

b. Training the power of endurance in exhaustless sector as an frequently practiced treatment

   Cardio-pulmonal ➔ neuromuscular

   Theravital/MotoMed Isokinetik f.e. daily, 2 Nm/sec, 50 U/min, 9 Min

   Heartfrequency 87/min, Borg Scala 11

   Lit.: Bocker, B 2008(Ger), Voom, E./Nollet, F. 2011(NL)
Breath dysfunction at PPS

- Involvement of the trunk-, breath(helping)musculature in polio paralysis had to turn our attention to Breath dysfunction and must be treated

- RLD and CAH are compensated by disability commitment of breath musculature

- Lung function testing and polysomnography after clinical examination are inalienable

- Breath-/breathhelpingmusculature is able to be coached with controlled power

- Impact of breath by secondary scoliosis effects are treatable

Dr. Axel Ruetz, Brüderkrankenhaus Koblenz
Lung function testing at Polio-Patients

Measure of breath-/lung function
- Bodylethysmography, P01 und Pi max., Spirometry

Measure of Thoraxelastizity
- Compliance/Elasticity measurement
Paralytic scoliosis

Usually long C shaped curve
Trunk collapse occurs if there is weak erector spinae muscles.
Long segment fusion is not the best treatment for trick movements of paralyzed legs
Orthosis might be used to delay fusion till maturity or much better for ever

Polio myelitis acuta anterior:
Asymmetrical infestation of motoric anterior horn cells of the spinal cord
Therapy of gain abilities and the orthotic accommodation

- Safety in standing, possibility to stand
- Avoid tumbling
- Relief osteoarthrosis
- Relief neuromuscular structures

• Prescription of an orthosis never without intensive lessons of instruction

Mary L. Jerrell, Orthotic Management of Post-Polio Syndrom, O&P WORLD, October 2004, 14-18

“20% of post-polio-syndrom-patients are candidates for stance control orthoses”
Video Gaitanalysis

Therapy of abilities of gait/orthotic devices

6 Minutes Walking Test
• Before and after test orthosis
• With the distance of walking
• With lactate acid measurement
• With oxygen saturation
• With Borg Scale
Optimal function by orthotic devices for polio survivors

Schmalz, Derwitz, Blumentritt, Ganganalyti. Untersuchungen von KAFO Versorgungen, Leipzig, 210504
Gait analyses for Polio-Patients without and with test orthosis
„Inhouse orthotic education and training“ with KAFO for polio-patients
NOK, Bremen 2010

**Hip disease**

Due to the risk of luxation, operation with total hip arthroplasty demands careful preoperative planning often including EMG, MRI and CT.

Well planned postoperative rehabilitation is mandatory.
Polio formed neuromuscular Hipdysplasia

Joint receive by hip osteotomies also useful
Neuromuscular Hipdysplasia

Alloarthroplastic by implantation of an hip endoprothesis
Hip replacement for Polio Patients

Dr. Haunschild, Abt Allg. Orthopädie u. Endoprothetik, Kinderorthopädie, 26 Hip Repl 2013

- minimal invasive surgery (MIC)
- with „no touch Technic“ of polio muscles
- Safety against luxation because of weakness Mm. gluteii
Hip endoprothetic for Polio patients

MRT hip joint before an hip replacement OP
Knee endoprothetic for Polio-Patients

• It must be reckoned with specific neuromuscular problems
• It must be concerned substantial knee ankle faulty form and ligamental failing in choice the joint replacement implants.
Knee endoprothesis by polio specific derangement
Cuff arthropathy with osteoarthritis after 40 y “stickshoulder” of an Polio patient

Possibility of inverse shoulder replacement must be well planed because of paralysis
Pes equinus varus adductus with ankle osteoarthritis in Polio Survivors, prä-/postoperativ

Benefit of arthrodesis
Osteoporosis and bone fractures by polio survivors

DCO:20100126
Authors: Mohammad AF; Khan KA; Galvin L; Hardiman O; O'Connell PG
Title: High incidence of osteoporosis and fractures in an aging post-polio population.
Source: European neurology; VOL: 62 (6); p. 369-74 /2009

Since the polio epidemic in Ireland in the 1950s, most polio survivors are approaching into the 6th and 7th decade of their lives. There is little data about bone density and risk of fractures in these patients. In 2006, we undertook an audit of post-polio patients attending rheumatology and neurology outpatient clinics in a university teaching hospital. Our aim was to determine the prevalence of osteoporosis (OP), falls and fractures and to evaluate the association of bone density with other potential contributing factors to OP.

METHODS: Over a 6-month period, 50 post-polio patients attending outpatient clinics completed a questionnaire, and subsequently their medical records were reviewed. Demographic data and details of treatment were extracted. The patients underwent a dual-energy X-ray absorptiometry scanning to quantify bone mineral density.

RESULTS: Thirty subjects (60%) were females (26 were postmenopausal). The average age of females was 60 +/- 13.4 years and of men 59 +/- 16.8 years. Overall, 41 (82%) of the patients had experienced falls in the last 5 years and 32 (64%) in the last 6 months. Nineteen (38%) of the patients had experienced a bone fracture in the last 5 years. Based on the bone mineral density data, 28 (56%) of the patients were diagnosed with OP and 20 (40%) had osteopenia, but only 8 (16%) received anti-resorptive therapy.

Of the 19 patients who had a fracture, 14 (74%) had OP and 5 (26%) had osteopenia, of whom only 6 (32%) received anti-resorptive therapy. Eight out of 9 fractures of the neck of femur occurred in the weaker leg. CONCLUSIONS: Post-polio patients are a high-risk group for fracture, and thus bone density assessment, review of falls risk and therapeutic intervention should be considered for all patients. Both osteopenia and OP are associated with increased fracture risk.
Treatment of bone fractures by polio survivors

- Consideration of the absence of muscle function (Relief to carry out a leg)
- Prevent advanced muscle weakness after immobilization (no rehabilitation)
- No casts
- No lying in bed
- No activity stop

(Polio survivor, 56y, third step with bone nail)
Regime at pain in cause of polio sequela

**Typ I**  
Post Polio Muscle Pain

- Cytidin-/Uridinphosphate i.m. or p.o.
- Gabapentin (Zapp JJ, Postpoliomyelitis pain treated with Gabapentin, AmFamPhysician 53, Nr.8, 1996: 2442-2445), possibly L-Carnitin

**Typ II**  
Overuse Pain

- Amitriptyllin, Paracetamol
- Triggerpoint-Lokalanästhesie Procain, Mepivacain etc.

**Typ III**  
Biomechanic Pain

- NSAR (COX-II-Hemmer), lokal i.a., ligamentär Injektionen Mepivacain, Glycerol, Steroide
Minimal invasive spine injection pain therapy at Polio sequelae

Particular standards of safety
Bisection of muscle effecting dose
Facetteinfiltration and -koagulation (Mooney/Robertson 1976) on polio survivors
Lumbal facettekoagulation for denervation of spondylarthrosis for a long term effect of spine pain in polio survivors with neuromuscular scoliosis

1576 facetteinfiltrations and -koagulations for HWS/BWS and LWS
2 complications while intervention
1 postinterventionelle infection in the conservative orthopedics in 6 years
Medicinal supportive therapy for Post Polio Muscle Pain

Kreatinkinase i.S. W<142,M<170
N=118 Poliopatienten mit diagnostiziertem PPS
Untersuchungszeitraum Juli bis September 2009

L-Carnitin- Schema:
1g L-Carn in 250 ml NaCl 0,9%
per inf. 1-0-1 für 5 Tage
CK und CK MB i.S. Tag 0 und 6 p > 0,01
2014 Polio Station: A concept becomes reality
Algorithm in diagnostic and therapy of Post-Polio-Syndrome

1. **Post-Polio-Muscleatrophy-Syndrom**
   - Researchlab Labor: CK-NAC (Myoglobin, LDH) < 142/170 U/l
   - Fasciculierender, atropher Muskelstatus = PPMA
   - Stationary acute treatment/Care
   - L-Carnitin i.v.
   - E-Wheelchair
   - Social medicine
   - psb. muscle fiber biopsie
   - Neuromuscular non-exhausted RespT/PT
   - Noninvasive ventilation
   - Night-O₂ %
   - Stationary Treatment Controlling SBDysfct

2. **Instabiles PPS state Stadium IV NRH**
   - yellow flag
   - Lung function testing, PG
   - Night-O₂ %
   - P_{01}/P_{MAX}
   - Polysomnographyie
   - Orthotics/Devices
   - Neuromuscular Protection
   - Active therapy
   - MTT/PT/Ergo
   - Orthotics/Devices
   - Orthetik/Hilfsmittel stabilising
   - Lab Check: CK-NAC
   - Active Therapy
   - MTT/PTG/Ergo
   - Ambulante Physiotherapy
   - Polio-Ambulance
   - Polio-Rehabilitation

3. **Stabile Post-Polio-Dysfunc-tionsyndrom I – III NRH-Classifikation**
   - green flag
   - Joint- / Muscle- / X-raydiagnostic
   - Spiroergometry
   - with lactat
   - Orthotics/Devices
   - Orthetik/Hilfsmittel stabilising
   - Active Therapy
   - MTT/PTG/Ergo

Bad Ems, 2004
Thank you very much

a.ruetz@kk-km.de
Polio Zentrum am Katholischen Klinikum Koblenz