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ORIGINAL ARTICLE

Observing movement disorders: best practice proposal in the use of video recording in clinical practice

Luisa Sambati[1,2] · Luca Baldelli, MD[2] · Giovanna Calandra Buonaura[1,2] · Sabina Capellari[1,2] · Giulia Giannini[1,2] · Cesa Lorella Maria Scaglione[2] · Massimo Armaroli[1] · Elena Zoni[1] · Pietro Cortelli[1,2] · Paolo Martinelli[1]

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Abstract

Clinical evaluation is of utmost importance in the semeiological description of motor disorders which often require video recording to highlight subtle signs and their subsequent evolution. After reviewing 1858 video recordings, we composed a suitable list of video-documentation maneuvers, classified semeiologically in the form of a "video recording protocol", to guarantee appropriate documentation when filming movement disorders. Aware that our proposed filming protocol is far from being exhaustive, by suggesting a more detailed documenting approach, it could help not only to achieve a better definition of some disorders, but also to guide neurologists towards the correct subsequent examinations. Moreover, it could be an important tool for the longitudinal evaluation of patients and their response to therapy. Finally, video recording is a powerful teaching tool as visual teaching highly improves educational training.

Keywords Video recording · Movement disorders · Protocol · Semeiological

Introduction

> Among all the senses, the human being prefers to visualize not only for practical, but cognitive theoretical reasons … with this sense, far better than the others, we acquaint not only cognition, but immediately also a multiplicity of differences [1].

The art of clinical examination is of paramount relevance in documenting the neurological abnormalities [2], sometimes requiring a more refined semeiological evaluation of the clinical picture and a comparison of the subsequent evolution. Movement disorders frequently require the evaluation of even subtle signs; hence, a sophisticated documentation is desirable.

Documenting by filming the patient has been employed since the last years of the nineteenth century and the first decades of the twentieth century, especially in Europe [3–5]. In contemporary scientific literature, detailed ethical issues as well technical specifications have been substantially addressed by Jog [6], Windsor [7], Miyasaki and Moskowitz [8], Taylor [9], and more recently by Duker [10], especially focusing on patients' privacy protection and improvement of data storage. Moreover, video recording can be considered as a powerful teaching tool, offered to implement the educational training as supported by Robakis [11].

Starting from a 70-year video-filming experience, we now suggest a detailed filming protocol including specific maneuvers addressed to specific movement disorders.

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✉ Paolo Martinelli
paolo.martinelli@unibo.it

[1] Department of Biomedical and Neuromotor Sciences, Unit of Neurology, Bellaria Hospital, University of Bologna, Via Altura, 3, 40139 Bologna, Italy

[2] IRCCS Istituto delle Scienze Neurologiche di Bologna, Via Altura, 3, 40139 Bologna, Italy

Methods

We have reviewed 1858 video recordings, which were singularly evaluated and categorized by an expert (PM) as (i) appropriate for exhaustive semeiological documentation, (ii) incomplete documentation, and (iii) insufficient documentation.

For the evaluation of the videos, we adopted the following criteria to distinguish and classify appropriate from incomplete and insufficient documentation. We considered recordings appropriate for exhaustive documentation when the video recording fulfilled clinical and semeiological purposes (e.g., assessing a tremor in all its features including the investigation of associated signs such as dystonia, bradykinesia, and rigidity). Videos were classified as incomplete when the semeiological maneuvers were lacking substantial data to fulfill clinical and semeiological purposes (e.g., brisk diffuse bilateral tendon reflexes without and adequate cutaneous plantar reflex evaluation). Finally, the recordings were classified as insufficient either when they failed to document the pathological basis of the examined disease (e.g., a postural and kinetic tremor with alleged suspicion of cerebellar origin without the documentation of an accompanying dysmetria and/or ataxia) or when the technical quality was inappropriate to allow the preceding classification.

The recordings assessed as "incomplete semeiological documentations" were discussed with a panel of neurologists to compose a suitable list of video-documentation maneuvers forming a "video recording protocol" to guarantee appropriate documentation when filming movement disorders.

Results

The following protocol enlists the suggested procedures and maneuvers that should be carried out when video-documenting movement disorders, semeiologically classified.

Video-recording protocol: general indications

General instructions

- Use a tripod equipped camera able to record 50–120 frames per second to prevent image distortions and in order not to neglect the rapid elements of hyperkinesia which could occur and need to be documented[1].
- A second collaborator (assistant) is necessary to carry out the video recording.
- The approximate recording time is 15 to 20 min.

[1] If a mobile device meeting the abovementioned requirements is to be used (smartphone, tablet, phablet), maintain a vertical frame.

Operator instructions

- Adopt a well-lit place and wide enough to allow the patient's recording both standing still and in motion.
- Ensure a uniform illumination; do not carry out the recording backlit.
- Define a specific distance between the camera and the patient to ensure the recording of any movement propagating in other parts of the body.

– Please consider that the zooming distance (usually set from 4 to 5 m) should allow the filming of the full-body shot of the patient within the video frame according to the focal length of the recording camera.

- Ask the patient to wear clothing adequate to the investigation purpose (i.e., a neutrally colored t-shirt and shorts), always respecting social and religious habits and which do not divert the attention of the examiner.
- Avoid sudden movements of the camera.

Assistant instructions

- Fill out the data collection sheet (cfr. Appendix 1).
- Explain to the patient the recording purpose, illustrate the informed consent in detail, and get the patient to sign it (cfr. Appendix 2).

General filming instructions

- Take a full-body shot of the resting patient, seated, with the hands' palms up, leaned on comfortable armchairs or on the thighs, the feet firmly on the ground, for 5 s.
- Use a head-on frontal view to focus on the face of the seated resting patient, for 5 s.
- Film the ocular movements (pursuits and saccades) using a pencil and stand behind the patient.
- Use a side view to evaluate posture, postural stability reflexes (getting up and sitting, pull-test), and the heel-toe tapping: the right side of the patient faces the camera.

– During the pull-test, the assistant stands behind the patient who is standing up with open eyes and feet slightly apart:

the assistant instructs the patient on what is about to happen and pulls towards him/her;
the assistant needs to be ready to catch the patient by putting his/her arms in proximity of the axillary region in order to avoid the patient falling backwards and should

carry out the procedure with his/her back not far from a solid wall.

- Film the patient gait moving away from the camera, turning, and moving towards the camera.
- Repeat every task up to a maximum of 5 times, unless otherwise specified.

Video-recording protocol: specific indications

Parkinson's disease and Parkinsonisms

- Film the face for 5 to 10 s, observing the mask-like expression, the corrugation of the frontal muscles and of the bridge of the nose, the decreased frequency of spontaneous blinking, and the persistence of the elicited one.
- Explore the ocular motility standing behind the patient, to notice possible limitations.
- Use a side full-body view to film the position of the head (antero-/retro-collis), of the trunk, and of the limbs.
- With the arms flexed at 90°, fully supported against gravity, film the hand to observe resting tremor of the fingers.
- Use a lateral view to film the passage of arms and hands from resting position to the defined posture.
- Ask the patient to perform simple activity tasks to evaluate apraxia, stereognosis, and extinction of tactile stimuli.
- Use a high angle lateral-back view to film the patient's writing task. Ask the patient to write a sentence, repeating the task a couple of time in order to assess the decrement in size.
- Ask the patient to cross his/her arms across the chest and then to stand up (in order to document the presence of a possible "rocket" sign).
- Film, if present, abnormal reflex activities (cutaneous-plantar reflex, deep tendon reflexes, frontal release signs: palmar grasp, palmomental reflex, snout reflex).
- Ask the patient to tap in sequence the heel and the toe on the floor, bilaterally.
- Ask the patient to walk back and forth. Firstly, focus on the presence—or on the reduction—of synkinesias and on the possible appearance of finger tremor, then on the stride length, and finally, on the change of direction and on the freezing of gait (if present).
- Apply, where appropriate, Unified Parkinson's Disease Rating Scale's (UPDRS) [12] items and identify the most significant ones to be filmed.
- If the purpose is directed towards recording dyskinesias, use frontal and lateral views, and, where appropriate, any scale to rate dyskinesia (e.g., Dyskinesia Rating Scale [13]).

Dystonia

- Film the face, resting, with both open and closed eyes, for 10 s.
- Film the patient asking him/her to:

  - Keep his/her eyes closed and then to reopen them. Repeat 3 times.
  - Keep the tongue protruded for 3 s.
  - Open and close the mouth. Repeat 3 times.
  - Eat a biscuit (eating dystonia).
  - *Evaluation of the active movement range of the neck.* Rotate the head rightwards and leftwards. Move the ear close to the ipsilateral shoulder. Look at the ceiling and at the floor.
  - Maintain his/her head in primary position against active resistance without support or geste antagoniste. *Use side view whenever appropriate.*
  - Extend his/her arms, supine.
  - Extend his/her arms, prone.
  - Flex the arms towards the sternum and the forearms towards the elbows.
  - Tap in sequence the heel and the toe on the floor, bilaterally. Repeat 5 times.
  - Walk back and forth for 5 m. Repeat twice.

- Film the effect of the "geste antagoniste" (e.g., touching the cheek, holding the chin, stretching back the neck, pushing back the head against a wall, etc.).
- In the case of dystonic tremor, ask the patient to draw a spiral without laying the forearm on the table, using the right hand first and then the left one. Use a posterolateral view.
- Using a lateral view highlight the presence of scoliosis or any muscular hypertrophy, asking the standing patient to flex his/her trunk forward.
- Ask the patient to utter a sentence in a colloquial tone of voice and then repeat it more loudly (spasmodic dysphonia-laryngeal dystonia).

Task- or position-specific dystonias

- Film the specific task/position that triggers the dystonic movement (e.g., playing the violin, the trumpet, the piano, mimicking the gesture to hit the golf ball with the club, etc.)

Writer's cramp (focal hand dystonia)

- Use a lateral-back view to film the patient's writing task.

Hyperkinesias

Tremor

- Identify the active body region. Start filming the whole body region and then focus with close-ups to the smaller districts (i.e., the whole resting upper limb, the arm, the forearm, the hand).
- Use a side view to film the passage between resting position and the posture with opposing index fingers.
- Ask the patient to perform the "Finger-to-nose Test." Use a close-up to document any rhythmic oscillation or the appearance of movements with perpendicular axis to the target.
- Fill 2 transparent plastic glasses until water reaches a preestablished mark. Ask the patient to pour water from one glass to the other without making the lids touch each other.
- Ask the patient to draw an Archimedean spiral.
- It is highly recommended to provide a simultaneous surface EMG recording.

Orthostatic tremor

- Film the patient standing, then, wait the appearance of the hyperkinesia.
- Document how the orthostatic tremor resolves during walking.
- Please note that because of its high frequency, the tremor could be not easily visible. However, it can be detected with palpation, auscultation, or measured with a concurrent EMG registration, both at rest and during walking.

Tic

- Use a full-body view as the body parts involved in the disorder may not be apparent at first, then focus with close-ups to the smaller districts when the location is identified.
- The following procedures are intended to put the patient in a situation where he/she should be less likely to mask his/her own tics. Tell the patient that the recording will continue even in the absence of the examiners. Then, explain to the patient that both the examiner and the assistant will leave the room for some reason. Ask the patient to remain seated and watch the red light on the camera, which will be positioned on the tripod in order to film the entire figure of the subject.

Palatal tremor

- Zoom in to illuminate adequately the inside of the oral cavity. Associate audio recording to document the presence of the typical "click."

Hemifacial spasm

- At rest: to document the right-left asymmetry of the mimic muscles and the eyelid or the rhythmic contractions of the mimic muscles of the hemiface.
- In action:

– Record the activation of the individual facial muscles: frowning, blowing, closing the eyes, showing the teeth, and the possible diffusion to other muscular groups.
– Evoke the blinking and the subsequent diffusion to all the mimic muscles.

Myoclonus

- Film, at rest, the body region affected by the hyperkinesias.
- Film for sufficient time to document the possible pseudoperiodicity of the hyperkinesia.
- Film the spontaneous or evoked activity from different stimuli (tactile, proprioceptive, sensorial).

Suggested EMG criteria for myoclonus:

- Record from antagonist muscles.
- Record the activity if evoked by stimuli of different nature.
- Record the presence of the paroxysmal activity and its spatiotemporal distribution (positive myoclonus) or, alternatively, the disruption of muscular activity (negative myoclonus) and its subsequent recovery.

Chorea and dyskinesias

- Use a full-body view and record for sufficient time to document the involuntary and continuously changing nature of choreic movements.
- Film the patient for 1 min, sitting at first, then standing up, focusing on possible limb or trunk dyskinesias-dystonias. Film postural dyskinesias when appropriate. It is very important to evaluate medication history (i.e., tardive dyskinesias).

Apraxia

- Ask the patient to perform a specific task (e.g., drawing a house, making the sign of the horns or the sign of the cross, getting dressed and undressed, etc.…).

Functional movements

- Always film both the affected and non-affected side at the same time.
- Document the inconsistency and the incongruity of the disorder.
- Apply distracting or activating maneuvers. Repeat bilaterally, 10 times per side. Have the patient:

– tap the index finger on the thumb as quickly and as wide as possible;
– open and close the fist as quickly and fully as possible;
– turn the palm up and down alternately as fast and as fully as possible;
– tap in sequence the heel and the toe on the floor.

- For axial localizations, film the patient during the execution of activities not linked to the neurological evaluation (e.g., standing up from the chair, getting dressed, getting undressed).
- Film whether each movement is carried out with an "effort" attitude or accompanied by a clear panting.
- Film one or more pull-tests to document the "dramatical" fall (frequently, but not always, with arms wide open).

Limitations

We are aware that our proposed filming protocol is far from being exhaustive or inclusive of every detectable movement disorder. Moreover, movement disorders are frequently part of complex clinical pictures such as in neurological diseases affecting the motor unit and the muscles. Thus, some specific filming procedures can be listed for these conditions (cfr. Appendix 3). Besides, by suggesting a more detailed documenting approach, it can help not only to better achieve a nosological definition, but also to guide the neurologist towards more appropriate second tier examinations (i.e., biologic, neurophysiologic, neuroradiologic, genetic, etc.), which should be based upon the clinical evidence.

Conclusion

In our work, we composed a video-recording protocol for the evaluation of movement disorders, after reviewing and examining about 1800 video recordings belonging to our center.

Applying a defined video-filming protocol including semeiologically classified convenient procedures allows not only to obtain appropriate documentation of movement disorders but also to uniform video-recording procedures, so that different operators can produce comparable video records. This is important both for clinical practice (e.g., discussion of clinical cases in panels) and for sharing clinical and experimental evidence (e.g., symposiums, congresses, etc.).

Besides, the importance of video filming has an intrinsic value, allowing a more detailed semeiological and then clinical definition of various movement disorders. In fact, using specific technical filming procedures may help to better focus on the essential components of a specific clinical picture.

Moreover, the comparison of subsequent video recordings offers a valuable tool in documenting not only the evolution of a specific disease, but it is also applicable to the study of response to traditional and advanced (e.g., deep brain stimulation in Parkinson disease) therapies.

Finally, visual teaching offers the best tool for the education of the new generation of specialists allowing first-hand evidence and visual experience.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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