**SHORT COMMUNICATION**

# The Use of Eponyms for Surgical Approaches and Fractures in Elbow Surgery: Accuracy and Reliability Pre- and Post-Training

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## Abstract

The use of eponymous terms in orthopedic trauma surgery is common. In an assessment pre-training versus post-training at an AO Advanced Elbow Trauma Course, we aimed to report on (1) the accuracy and (2) reliability of 10 common eponymous terms used for surgical approaches and fractures in elbow surgery. Before training, eponyms were described correctly in 38% of questions versus 47% after training. The percentage of correct answers only improved significantly in one question (*P<0.005*). A generalized kappa of 0.37 before training versus 0.31 after training represents an overall fair reliability of the eponymous terms. In conclusion, the accuracy and reliability of eponymous terms used in elbow surgery is disappointing. Moreover, this type of standardized training format does not seem to improve the knowledge of eponymous terms of experienced trauma- and orthopedic surgeons. Therefore, we suggest considering descriptive terms or standardized fracture classifications instead of eponymous terms.

**Level of evidence:** II

**Keywords:** Accuracy, Elbow, Eponyms, Fracture, Reliability, Surgical approach, Teaching

## Introduction

The use of eponymous terms is common in orthopedic and trauma surgery (1-4). The word eponym means 'named after' and originates from the Ancient Greek language. Today, there are about 20.000 medical eponymous terms in use (5, 6). In general, the name of the first person that has discovered or described a fracture pattern, disease, or surgical procedure will become an eponymous term and the person becomes an eponym.

Several studies investigated original definitions of coined authors and reported on the practice of eponymous terms in surgery (2, 7, 8). In 2015, our group investigated and reported on the original descriptions of eponymous terms, tracing back to the index publications in classic manuscripts used in elbow fracture surgery. Then in 2016, the same group investigated whether the original meaning of eponymous terms in shoulder and elbow surgery had been preserved in references over

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time. Interestingly, the majority of very well 'known' eponyms are incorrectly referred to in scientific articles, ranging from 82% correct definitions used for Essex-Lopresti injuries, to an astonishing 0% correct descriptions of Bristow-Latarjet (4). Finally, in 2017, Somford and colleagues studied the accuracy and reliability of the use of orthopedic eponymous terms as compared to their original descriptions in orthopedic surgery, by interviewing more than 200 surgeons. They concluded that eponymous terms are often an inaccurate and unreliable method of communication (3). Other authors also concluded that eponyms could be confusing when used inconsistently or inaccurately (9, 10). Nevertheless, eponyms remain part of daily practice throughout the globe (3).

As with classification systems for fractures and ligament injuries, eponymous terms should be used accurate and reliable to improve our understanding, facilitate comparison of clinical research and increase efficacy in daily practice (11, 12). Perhaps differences in training and emphasis on eponymous terms may play a role.

Therefore, the aim of the current study was to evaluate the effect of a validated internationally standardized course on cadaveric specimen in which anatomy and approaches were described extensively, including the eponymous terms, on the accuracy and reliability of eponymous terms used for surgical approaches and fractures in elbow surgery of practicing orthopedic trauma surgeons.

## Materials and Methods

### *Study design*

All 20 participants of the AO Advanced Trauma Course "Complex Elbow Fractures" (Leiden, the Netherlands, 2017) were asked to fill out a paper survey; 1) Before the start of the course (pre-training assessment); and 2) After participating in the course (post-training assessment) (Appendix 1). The questionnaire assessed the knowledge of practicing orthopedic trauma surgeons, with a specific interest in elbow surgery, on the original description of coined authors and commonly used eponymous terms in elbow surgery (2). Participants were asked to fill out 'I do not know' in case of doubt. Primary outcome of the survey is the baseline knowledge of eponymous terms, expressed as the percentage of questions answered according to the original description (accuracy). Secondly, pre- and post-training accuracy will be compared to assess the effect of training exposure to the eponyms. In addition, the proportion of agreement of the answers (reliability) will be calculated before- and after- training.

### *Survey*

The participants were handed out a paper survey consisting of 10 multiple-choice questions about the meaning of 10 common eponymous terms in elbow surgery before- and after- their participation in the international and standardized Advanced Elbow Trauma Course. Each multiple-choice question contained five answers, of which one was the correct answer and one option was 'I do not know'. The eponymous terms were: 1. Kocher; 2. Kaplan; 3. Henry; 4. Boyd; 5. Hotchkiss; 6. Monteggia; 7. Galeazzi; 8. Essex-Lopresti; 9. Hahn-Steinthal; 10. Osborne-Cotterill. The eponyms and their respective original descriptions in the index manuscripts are presented in Table 1. Because we assessed eponymous terms used in elbow surgery, the Henry approach in the elbow was quizzed, whereas the Henry approach for the forearm was left out of the survey. Course- and survey language were English. The reference standard for accuracy in terms of sensitivity was the original description by the original author.

### *Study population*

All participants were experienced and practicing orthopedic trauma surgeons with specific interest in elbow trauma surgery. Among the 20 participants of the course, 17 participants completed the survey both before and after the course, 2 participants completed the survey only before and 1 participant only after the

**Table 1. Question numbers and eponymous terms with their original description**

| Question | Eponym | Original description |
|---|---|---|
| 1. | Kocher (13) | Approach between the anconeus and the extensor carpi ulnaris |
| 2. | Kaplan (14) | Approach between the extensor digitorum communis and the extensor carpi radialis brevis |
| 3. | Henry (15) | Approach between the brachialis and the brachioradialis |
| 4. | Boyd (16) | Approach through the anconeus and the supinator |
| 5. | Hothckiss (17) | Approach between the flexor carpi ulnaris and the palmaris longus/flexor carpi radialis |
| 6. | Monteggia (18) | Any fracture of the ulna with any dislocation of the radial head in the proximal radio-ulnar joint |
| 7. | Galeazzi (19) | Any fracture of the radius with any dislocation of the distal radio-ulnar joint |
| 8. | Essex-Lopresti (20) | Any radial head fracture with dislocation of the distal radio-ulnar joint and disruption of the interosseous membrane |
| 9. | Hahn-Steinthal (21,22) | An isolated capitellar fracture |
| 10. | Osborne-Cotterill (23, 24) | An osseous defect of the posterior part of the capitellum associated with posterolateral instability of the elbow |

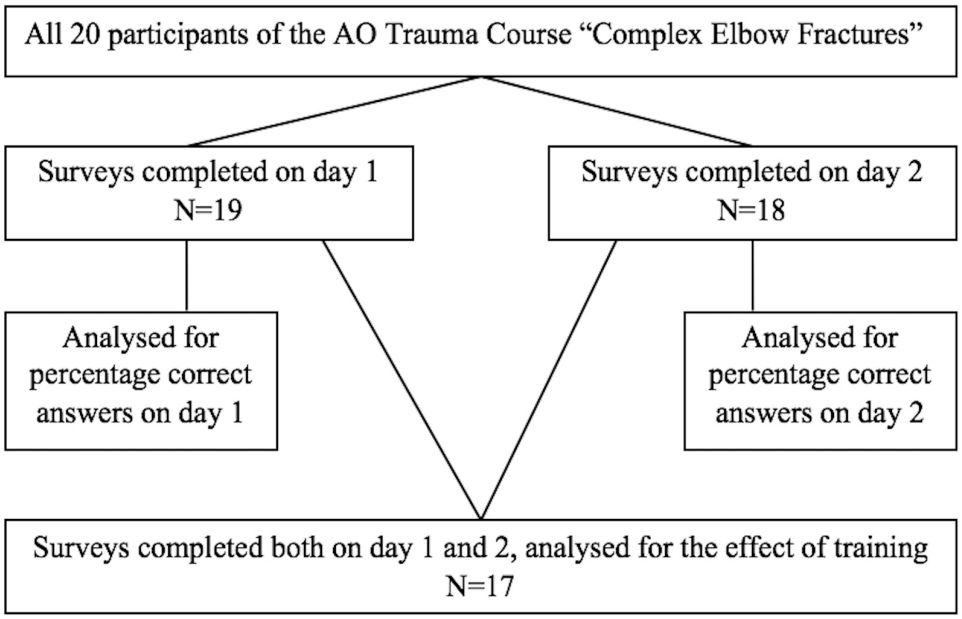


**Figure 1. Flowchart statistical analysis of surveys on day 1 (pre-course) and 2 (after the course).**

**Table 2. Baseline characteristics of the respondents (N=20)**

| | | (N) | (%) |
|---|---|---|---|
| **Country of practice** | The Netherlands | 19 | 95 |
| | Sweden | 1 | 5 |
| **Region of interest** | Trauma | 18 | 90,0 |
| | Upper extremity | 11 | 55 |
| | Lower extremity | 7 | 35 |
| | Sport | 3 | 15 |
| | Pediatric | 2 | 10 |
| | Spine | 1 | 5 |
| | General | 1 | 5 |
| **Experience (years)** | 0 – 5 | 12 | 60 |
| | 5 – 10 | 5 | 25 |
| | 10 – 20 | 3 | 15 |

course [Figure 1]. Most observers that participated in the survey were from the Netherlands (95%), had 0-5 years of independent practice (60%), and were specialized in trauma (90%) and/or upper limb (55%) [Table 2].

### *Statistical analysis*

After completing the paper survey before and after the course, the data was retrieved and summarized using descriptive statistics. Demographic data of the respondents are reported by use of frequencies and accompanying percentages.

Primary outcome of the survey was the percentage of questions answered corresponding with the original description, labelled as 'knowledge present'. The other answers were labelled as 'knowledge absent', making no difference between a divergent answer or the answer 'I don't know'. This algorithm was previously used and described by Somford et al (3).

Secondary outcomes were the differences in accuracy before and after the course. To assess the effect of training the McNemar test was used. A *P-value <0.05* was considered statistically significant. Moreover, reliability of the eponymous terms was calculated before- and after-training using the Fleiss' kappa and compared using the Z-test. The kappa value was interpreted according to the categorical rating of Landis and Koch (13).

## Results

Nineteen participants completed the survey on the first day. Before training, eponymous terms were described correctly on average in 38% of questions (range, 0 – 84%). Not one of the questions was answered correctly by all participants together (i.e. 100% correct score). Boyd, Hotchkiss, and Osborne-Cotteril, scored the lowest similarity with the original description (0%), whereas Kocher had the highest similarity with the original description (84%) [Figure 2]. A generalized kappa of 0.37 (proportion of agreement 0.53) represents an overall fair reliability of the eponymous terms.

On the second day, 18 participants completed the survey. Eponymous terms were described correctly

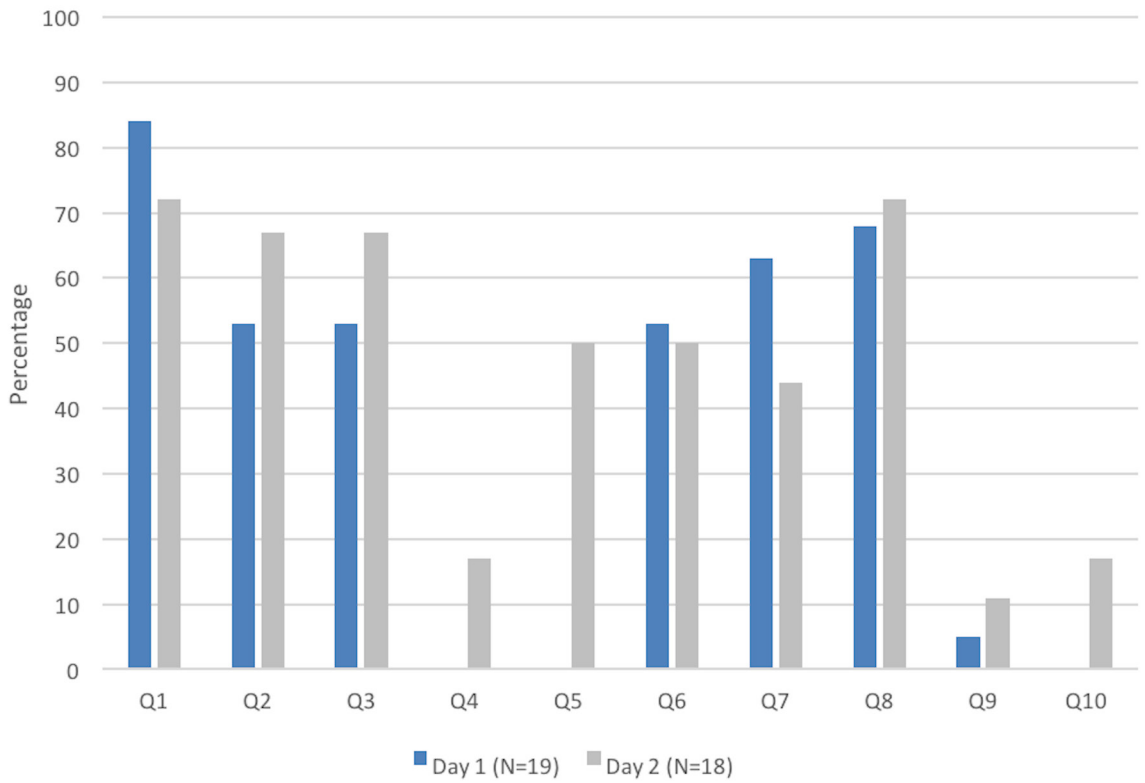


**Figure 2. Percentages of correct answers corresponding with the original description on day 1 (pre-course) and 2 (after the course).**

on average in 47% (range, 11 – 72%) of the questions after training. Again, for none of the eponymous terms a correct score of 100% was achieved. Hahn-Steinthal had the lowest correspondence with the original description (11%), Kocher and Essex-Lopresti, had the highest correspondence with their original descriptions (72%) [Figure 2]. A generalized kappa of 0.31 (proportion of agreement 0.46) represents again an overall fair reliability of the eponymous terms.

After the course, the percentage of correct answers only improved significantly for one eponym; Hotchkiss (*P<0.005*). In the other nine questions, there was no significant difference between the percentage of correct answers between the responses prior- and after- the training. Moreover, there was no statistical significant difference in reliability before- and after- training.

## Discussion

In a recent global survey, we found that the accuracy and reliability of orthopedic eponymous terms as used by orthopedic surgeons, are often an inaccurate- and unreliable method of communication (3). Therefore, the purpose of the current study was to evaluate the effect of a specific course that addressed anatomy and approaches involving many eponyms, on the accuracy and reliability of eponymous terms of surgical approaches and fractures used in elbow surgery.

The results show that the knowledge of eponyms can be considered poor with an average of 38% of the questions answered correctly prior to the training and an 47% on average after the course. Moreover, none of the eponymous terms was used consistently with a generalized kappa of 0.37 before- and a generalized kappa of 0.31 after- training.

Based on the results of the current study we conclude that with an increased percentage of correct answers in only one question, the effect of this type of training is marginal with respect to the knowledge of eponymous terms. Although the training included both passive and active sessions, i.e. lectures and cadaveric sessions focused on surgical (elbow) approaches and elbow fractures all mentioned as eponyms, no emphasis was placed on explaining the mentioned eponyms and no improvement of knowledge of eponymous terms was demonstrated. An explanation for the minimal improvement of correct answers on after the course could be the fact that the participants were not informed individually about their results of the first day. Moreover, they did not know that they would be asked to fill out the same survey on the second day again. It is questionable if the participants should have paid more attention on eponymous terms during the training if they knew their results of the first day and the intention of the survey in advance. The relatively high generalized kappa's before

and after training can partly be explained by the fact that in a couple of questions almost all participants filled in 'I do not know' which represents a high agreement. However, this is not an eligible answer in the light of daily practice.

With a total of 20 participants, mostly working in the Netherlands, the number of observers is small. Applicability of the results outside the Netherlands and Europe will therefore be limited. Interestingly, a study of Somford et al revealed that orthopedic surgeons in Europe use eponymous terms more often than their colleagues from the United States, Canada and Australia (3). However, European surgeons are less accurate in the correct definition for these eponyms, than surgeons from other continents. This may reflect differences in training across continents.

Our findings are consistent with a recent study that studied the accuracy of eponyms used in 96 published articles on elbow and shoulder injuries. On average 39% of the eponymous terms was used correctly (8). Waseem and colleagues reported on the accuracy of the use of the eponym Finkelstein's test. They found that only 10 of 92 assessed Orthopedic surgeons could define and perform the test as originally described by Finkelstein (10). All these findings support that the use of eponymous terms in modern medicine is an inefficient way of communication.

Therefore, we recommend that the use of eponyms should be avoided in both communication and teaching activities. Hence, we suggest considering the use of descriptive terms and validated classifications, since these are more clarifying and less confusing.

The accuracy and reliability of the use of eponymous terms by experienced trauma- and orthopedic surgeons used in elbow surgery is low. Moreover, the type of training used during an Advanced Elbow Trauma Course does not seem to influence the knowledge of eponymous terms. Therefore, we suggest considering the use of descriptive terms and validated classifications instead of eponymous terms. Since many of the eponyms will be used continuously, we suggest that further evaluation of teaching methods for eponymous terms may help improve the correct use of these terms in future.

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**What is the correct answer according to the coined author in the original manuscript:**

1. Kocher approach:
    A. Approach between the Anconeus and the Brachioradialis;
    B. Approach between the Anconeus and the Extensor Carpi Radialis Longus;
    C. Approach between the Anconeus and the Flexor Carpi Ulnaris;
    D. Approach between the Anconeus and the Extensor Carpi Ulnaris;
    E. I don't know what the Kocher approach is.

2. Kaplan approach:
    A. Approach between the Extensor Digitorum Communis and the Extensor Carpi Ulnaris;
    B. Approach between the Extensor Digitorum Communis and the Extensor Carpi Radialis Brevis;
    C. Approach between the Extensor Carpi Radialis Brevis and the Extensor Carpi Radialis Longus;
    D. Approach between the Extensor Carpi Ulnaris and the Anconeus;
    E. I don't know what the Kaplan approach is.

3. Henry approach
    A. Approach between the Brachialis and the Brachioradialis;
    B. Approach between the Brachioradialis and the Pronator Teres;
    C. Approach between the Brachialis and the Pronator Teres;
    D. Approach between the Brachialis and the Triceps;
    E. I don't know what the Henry approach is.

4. Boyd approach
    A. Approach between the Anconeus and the Supinator;
    B. Approach through the Anconeus and inferior of the Supinator;
    C. Approach through the Anconeus and the Supinator;
    D. Approach through the Anconeus and superior of the Supinator;
    E. I don't know what the Boyd approach is.

5. Hotchkiss approach
    A. Approach through the Flexor Carpi Ulnaris;
    B. Approach between the Flexor Carpi Ulnaris and the Palmaris Longus/Flexor Carpi Radialis;
    C. Approach inferior of the Flexor Carpi Ulnaris;
    D. Approach detaching the Common Flexor tendon;
    E. I don't know what the Hotchkiss approach is.

6. Monteggia fracture
    A. Any fracture of the ulna with any dislocation of the radial head in the proximal radio-ulnar joint;
    B. Any fracture of the ulna in combination with an anterior dislocation of the radial head at the proximal radio-ulnar joint;
    C. A fracture of the proximal third of the ulna in combination with an anterior dislocation of the radial head at the proximal radio-ulnar joint;
    D. Any fracture of the ulna in combination with a posterior dislocation of the radial head at the proximal radio-ulnar joint;
    E. I don't know what a Monteggia fracture is.

7. Galeazzi fracture
    A. Any fracture of the radius with any dislocation of the distal radio-ulnar joint;
    B. A fracture of the proximal radius with any dislocation of the distal radio-ulnar joint;
    C. Any fracture of the radius with a dorsal dislocation of the ulna in the distal radio-ulnar joint;
    D. A fracture of the proximal radius with a dorsal dislocation of the ulna in the distal radio-ulnar joint;
    E. I don't know what a Galeazzi fracture is.

8. Essex-Lopresti injury
    A. Comminuted radial head fracture with dislocation of the distal radio-ulnar joint and disruption of the interosseous membrane;

B. Any radial head fracture with dislocation of the distal radio-ulnar joint and disruption of the interosseous membrane;
C. Any radial neck fracture with dislocation of the distal radio-ulnar joint and disruption of the interosseous membrane;
D. Two-part radial head fracture with dislocation of the distal radio-ulnar joint and disruption of the interosseous membrane;
E. I don't know what an Essex-Lopresti injury is.

9. Hahn-Steinthal fracture
   A. Isolated coronoid process fracture;
   B. Isolated capitellar fracture;
   C. Capitellar fracture with radial head intra articular fracture;
   D. Capitellar fracture extending within lateral half of trochlea;
   E. I don't know what a Hahn-Steinthal fracture is.

10. Osborne-Cotterill lesion
   A. An osseous defect of the posterior part of the capitellum associated with posterolateral instability of the elbow;
   B. An osseous defect of the posterior part of the capitellum and the lateral epicondyle associated with posterolateral instability of the elbow;
   C. Any osseous defect of the capitellum, the radial head and the lateral epicondyle associated with instability of the elbow;
   D. Any osseous defect of the capitellum and the radial head associated with instability of the elbow;
   E. I don't know what an Osborne-Cotterill lesion is.