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Identifying Injury Patterns Associated with Physical Elder Abuse: Analysis of Legally Adjudicated Cases

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Abstract

Background: Elder abuse is common and has serious health consequences but is under-recognized by health care providers. An important reason for this is difficulty in distinguishing between elder abuse and unintentional trauma. Our goal was to identify injury patterns associated with physical elder abuse in comparison with patients presenting to the emergency department (ED) with unintentional falls.

Methods: We partnered with a large, urban district attorney's office and examined medical, police, and legal records from successfully prosecuted cases of physical abuse of victims aged 60 from 2001–2014.

Results: We prospectively enrolled patients who presented to a large, urban, academic ED after an unintentional fall. We matched 78 cases of elder abuse with visible injuries to 78 unintentional falls. Physical abuse victims were significantly more likely than unintentional fallers to have bruising (78% vs. 54%) and injuries on the maxillofacial/dental/neck (67% vs. 28%). Abuse victims were less likely to have fractures (8% vs. 22%) or lower extremity injuries (9% vs. 41%). Abuse victims were more likely to have maxillofacial/dental/neck injuries combined with no upper

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and lower extremity injuries (50% vs. 8%). Examining precise injury locations yielded additional differences, with physical elder abuse victims more likely to have injuries to the left cheek / zygoma (22% vs. 3%) or on the neck (15% vs. 0%) or ear (6% vs. 0%).

Conclusion: Specific, clinically identifiable differences may exist between unintentional injuries and those from physical elder abuse. This includes specific injury patterns that infrequently occur unintentionally.

INTRODUCTION

Background

Elder abuse is common,¹⁻³ has serious consequences,⁴⁻¹⁰ and is under-recognized.^{1,3,11} It is estimated that 5–10% of U.S. older adults are victims of elder abuse annually.¹⁻³ Victimization is associated with adverse health outcomes including: depression,⁴ exacerbation of chronic illnesses, hospitalization,⁵ nursing home placement,^{6,7} and dramatically increased mortality.⁸⁻¹⁰ Although not easily quantified, abuse is estimated to cost many billions of dollars annually.^{12,13} Anticipated growth in the geriatric population will likely dramatically increase this disease burden and cost.¹⁴⁻¹⁶ This mistreatment may include physical abuse, sexual abuse, neglect, psychological abuse, or financial exploitation, and many victims suffer from multiple types of abuse.^{1-3,17} While physical abuse occurs less frequently, with a reported prevalence of 0.2–2.1% among community-dwelling older adults,^{1,18-20} this violent mistreatment may be particularly devastating for an older adult.

Importance

As few as 1 in 24 cases of elder abuse is reported to the authorities,^{1,3,11} and much of the associated morbidity and mortality results from this delay in identification and intervention.²¹ For many older adults, assessment by health care providers may represent their only contact outside the home. These providers, therefore, have a unique opportunity to identify suspected elder abuse, report it to Adult Protective Services and other authorities,²²⁻²⁸ and initiate intervention. Given that physical abuse may cause acute injury leading to a health care visit more commonly than other types of elder mistreatment, health care providers may have a unique opportunity to identify this abuse and initiate intervention. Despite this, health care providers seldom identify or report elder abuse.²⁹ An important reason for this is the difficulty in distinguishing between physical elder abuse and the sequelae of unintentional trauma.^{21,30-33} Identifying evidence-based injury patterns that very seldom occur due to an accident is the cornerstone of detecting child abuse,³⁴⁻⁴⁷ which physicians do commonly. This approach is based on literature that includes systematic reviews and large comparison studies describing key features that distinguish abuse from unintentional injury. Though injuries potentially suggestive of elder abuse have been anecdotally described,^{21-28,48-56} very little rigorous research^{21,57-59} comparing all injuries in confirmed cases of physical elder abuse to those in non-abused older adults has been conducted to identify injury patterns to aid clinicians in identifying physical elder abuse when evaluating purportedly unintentional injuries. Differentiating intentional and unintentional injuries in older adults is more challenging due to normal physiologic changes that occur with aging^{21,30-33} including

osteopenia, thinning of the skin, and easy bruising as well as the impact of medications commonly used including anti-coagulants.

Existing studies have begun to describe bruise location and size^{57,58} and body regions frequently injured in physical elder abuse.^{21,59} Additional research is critically needed to inform elder abuse detection, with the goal of identifying potentially highly specific injury patterns and forensic findings.

Goals of this Investigation

We collaborated with the Elder Abuse Unit of the King's County District Attorney's Office in Brooklyn, New York to examine in detail injury characteristics and patterns from a large series of legally adjudicated cases of physical elder abuse. As the limited existing literature suggests that victims and abusers often falsely report that abuse-related injuries are due to an unintentional "fall,"⁵⁸⁻⁶⁰ we used geriatric patients presenting to the emergency department after an unintentional fall as a comparison group. Our goal was to identify differences between injury patterns associated with physical elder abuse and those associated with unintentional falls to assist health care providers in identification of abuse.

METHODS

Study Design and Setting

We conducted a comparative study with a case-control design to identify differences in injury characteristics and patterns between physical elder abuse and unintentional injuries, similar to approaches used to identify injury patterns in child abuse^{43,61} and in smaller studies focused on elder abuse.^{4,26} In our study, we compared injuries in elder abuse cases where the perpetrator had been convicted or pled guilty to those in patients presenting to the ED after unintentional falls. We followed STROBE guidelines regarding the reporting of observational research.⁶²

Assessment of Physical Elder Abuse Cases

In order to assess elder abuse cases, we partnered with the King's County District Attorney's Office, which maintains an Elder Abuse Unit, a legal team devoted exclusively to the investigation of cases, prosecution of abusers, and protection of these vulnerable victims. We examined 100 successfully prosecuted cases of physical abuse of a victim aged 60 years where the perpetrator had been convicted or pled guilty from 2001–2014. We did not include cases sealed by the court because the abuser elected to enter and successfully completed a substance abuse or mental health treatment program.

We defined physical abuse using New York State Social Services Law, Article 9B, Adult Protective Services, Section 473(6) as: "the non-accidental use of force that results in bodily injury, pain or impairment, including but not limited to, being slapped, burned, cut, bruised or improperly restrained" by a person in a relationship with the victim with an expectation of trust. This law is similar to the consensus definition from National Research Council,¹⁷ which incorporates the content of statutes from different U.S. states, and the definitions

recently proposed in the Elder Justice Roadmap¹² and by the Centers for Disease Control and Prevention.⁶³

We reviewed police, legal, and medical records, including photographs and victim statements, to gather detailed information about the injuries, the victim, the abuser, and the circumstances surrounding the physical abuse incident and its detection.

To facilitate the complete and accurate characterization of injuries, we developed a novel taxonomy⁶⁴ that uses a 3-step process to describe and classify visible, acute, injuries in geriatric victims. It includes 9 unique types of visible injury and 7 characteristics common to all injury types, including 6 body regions and 247 precise anatomic locations. Research team members reviewed photographs and abstracted data from medical records including physical exam descriptions and imaging reports using a protocol developed by three of the authors (TR, VML, EMB), who trained other authors (AE, TM) who participated in the process. Two separate researchers, one of whom was a physician (TR or VML), independently evaluated each photograph to ensure consistency and accuracy of the descriptions. To increase the utility of our findings for clinicians, we grouped the 247 precise anatomic locations into 99 meaningful sub-regions for analysis (available in Online Supplemental Material).

Enrollment of Control Patients

We prospectively enrolled control patients aged 60 years who presented to the ED after an unintentional fall from September 2014 – June 2018 in a large, urban, academic medical center in Manhattan, New York City. Trained Research Associates (RAs) recruited patients from 7:30AM-11:30PM 7 days a week. The use of RAs is common in Emergency Medicine research and is well-described.⁶⁵ We excluded patients if they did not speak English, were acutely intoxicated, or were deemed medically or psychiatrically unstable by the treating physician. We enrolled study patients unable to provide informed consent if a legally-authorized representative was able to consent on their behalf.

We conducted a standardized interview to collect information on demographics, health, functional status, and circumstances surrounding the fall injury, and a structured data abstraction form was used to gather information from the medical record for the ED visit. To allow for optimal comparison with injuries sustained by victims of physical elder abuse, we instructed RAs to photograph each injury using a standardized photography protocol developed by our group.⁶⁶ The protocol describes in detail appropriate types of photographs and body positioning to characterize injuries on various body regions and includes instructional diagrams. We described and categorized injuries using the same process used for injuries in the elder abuse cases.

To ensure that injuries were truly due to unintentional falls and not the result of physical elder abuse, we included the validated Elder Abuse Suspicion Index⁶⁷ which we administered privately to each potential study patient. We excluded from the study patients who screened positive, and the results of these screens were reported to the clinical care team and the on-duty social worker. The research team also reviewed all hospital medical

records for the enrollment visit and for visits for six months after enrollment to ensure that elder abuse was not subsequently identified.

Statistical Analysis

We matched elder abuse cases and unintentional fall controls with injuries 1:1 using individual matching on age (5-year age groups), sex, and living in the community vs. institution. These factors were determined a priori given their potential to confound our analysis of injury patterns. We conducted sensitivity analyses that examined the effect of additionally matching on race.

Results are presented as percentages and 95% confidence intervals (CIs) or medians (with interquartile range). We compared elder abuse cases and fall patients with McNemar's tests, Paired t-tests, and Wilcoxon sign-rank tests, as appropriate. All *P* values were two-tailed, with *P* < 0.05 considered statistically significant. We also performed conditional multivariable logistic regression to identify differences in injury patterns between cases and controls while adjusting for injury severity, time between injury and presentation, and total number of injuries. We used Stata 14.0 (StataCorp, College Station, TX) for all analyses.

This project was reviewed and approved by the Weill Cornell Medicine Institutional Review Board.

RESULTS

Characteristics of Study Patients

We examined 100 successfully prosecuted physical elder abuse cases. Of these, 78 had visible injuries resulting from the abuse. We matched these 78 cases to 78 control patients on age, sex, and living in the community vs. institution drawn from among 578 enrolled patients who sought ED care for injuries after an unintentional fall. 863 potential study patients declined study participation. Five potential patients screened positive on the Elder Abuse Suspicion Index and were excluded. None were found to be victims of physical elder abuse after a more complete evaluation. No additional patients were excluded after medical records review. Figure 1 summarizes the sources of case and control patients. Notably, we had originally anticipated requiring the enrollment of 200 control patients during 12 months to match to cases, but, given differences in characteristics, particularly age, between cases and initially enrolled controls, we extended the control enrollment period by 34 months.

Overall, cases and controls had a mean age of 71 (SD 9) years, 73% were female, and 97% lived in the community. Cases and control patients differed according to race/ethnicity (cases: 46% white, 45% black, 4% other race, and 5% unknown vs. controls: 78% white, 5% black, 3% other race, and 14% unknown). (Table 1). Only one-third of victims received care in the ED after abuse was detected, with many refusing Emergency Medical Services transport. The most common mechanisms of physical abuse were blunt assault with hands/fists (62%) and push/shove or fall during altercation (23%).

Law enforcement or medical provider photographs of at least one of the victim's injuries at the time of elder abuse identification or injury evaluation were available for (47/78) 60% of physical elder abuse cases, and medical records were available for 26% (20/78).

Main Results

We examined 264 injuries in these 78 physical elder abuse victims. Photographs were available for 166 (63%) injuries and medical record and police report descriptions were relied upon for 98 (37%) injuries. For some cases, photographs were available for some injuries but not others. We compared the injuries suffered by abuse victims to 217 injuries in 78 fall control patients. Photographs were available for 119 (55%) injuries and medical record descriptions were relied upon for 97 (45%) injuries in fall control patients. Based on available information, we were able to describe the sub-region for a total of 417 injuries in cases and controls (87%) and the precise location of 408 (85%).

Though intentional fall injuries were slightly more severe, neither cases nor controls typically suffered severe injuries. (Table 2) The most common types of abuse-related injuries were bruises (78% of victims), lacerations (32%), and abrasions (32%). Clear differences in injury patterns between abuse victims and fallers were observed. Physical abuse victims were significantly more likely to have bruising (78% vs. 54%, 24% difference (95% confidence interval of difference: 8–41%)) and injuries on the maxillofacial/dental/neck region (67% vs. 28%, 38% difference (22,55)) or chest/abdomen/back (19% vs. 4%, 15% difference (4,27)). Abuse victims were less likely to have fractures (8% vs. 22%, –14% difference (–26,–2)) or injuries on the lower extremities (9% vs. 41%, –32% difference (–45,–19)).

We also examined patterns that included both presence and absence of injuries in body regions. We found that abuse victims were significantly more likely to have visible injuries in the maxillofacial/dental/neck region without injuries to the upper or lower extremities (50% vs. 8%, 42% difference (28,57)). Significant differences also existed when examining maxillofacial/dental/neck injuries and the absence of upper extremities, lower extremities, and pelvis/buttocks injuries individually or in any combination.

We also identified 8 sub-regions more commonly injured in physical elder abuse victims than fallers (Table 3), including the left cheek/zygoma, the ears, and the neck. These findings further suggest differences in patterns between abuse and falls that may be used by clinicians at the bedside. (Figure 2)

Notably, we found differences that were not significant between cases and controls in injuries to the ulnar and posterior forearm (9% vs. 4%, 5% difference (–4,14)) on either or both sides and to the left ulnar and posterior forearm (4% vs. 0%, 4% difference (–2,9)).

All findings of significant difference in injuries between cases and controls remained significant in multivariable logistic regression that adjusted for injury severity, time between injury and evaluation, and total number of injuries in individual models and a combined model.

Because of the difference in race/ethnicity between elder abuse cases and unintentional fall controls, we conducted a sensitivity analysis matching on race in addition to age, sex, and living situation. The number of available matched pairs was reduced to 54. Among this subset, no material changes in our results were observed (available in Online Supplemental Material).

Among the 22 elder abuse victims who did not sustain visible injury, pain was most commonly reported in the chest/abdomen/back (32%), maxillofacial/dental/neck (22%), and upper extremities (22%). Twenty-seven percent had documentation of no indication of pain.

LIMITATIONS

Our research examines physical elder abuse in a New York City and may not be generalizable to other populations. We only included cases of physical elder abuse that were identified and successfully adjudicated by the legal system. This represents a small percentage of all cases, and victims of the mistreatment analyzed here may have experienced more acute or severe abuse allowing identification. Subtle cases of abuse that are more challenging to detect and prosecute likely haven't been included. Cases examined here also may reflect victims with a better support system, increased ability to report abuse, and better health care and legal literacy. This is highlighted by the fact that, in the large majority of cases in this analysis, abuse was detected when the victim him/herself contacted 911.

Victims with cognitive impairment are underrepresented in our research yet are thought to be at greater risk for elder abuse.⁶⁰ Additionally, our sample includes very few abuse victims who live in institutions, and as such our research findings may not apply to those populations or settings. The majority of the abuse victims included in this research were not evaluated in the ED, with many refusing transport after abuse was detected. It is possible that victims who present to EDs differ in important ways from those who do not. Although our study was not powered for this purpose, we did not observe differences between elder abuse victims who did and did not present to the ED.

Case files were assembled for law enforcement and prosecution purposes rather than research, and, therefore, medical records and photographs were not available for many cases. Additionally, photographs examined were of variable quality and medical records had variable detail and completeness. We did not find any sexual abuse among the cases we examined, but given that sexual abuse and physical abuse may co-occur and that sexual abuse is underrecognized, it is possible that it was missed.

Our control group was recruited from a single urban ED, which increases feasibility, but nearly all physical elder abuse victims who were transported to an ED were taken to other institutions than the one where we enrolled controls. The potential for this to impact results is highlighted by racial differences between cases and controls, and other important differences, such as socioeconomic status, may exist between the groups. While our results did not materially change in sensitivity analyses adjusting for race/ethnicity, it remains possible that the two groups differed according to socioeconomic status and other characteristics we were not able to measure. While injuries in control patients were

photographed using a standardized protocol, those available for cases were not. Differences in photograph quality may have led to differential identification of visible injuries.

Many potential control patients refused participation, and these fallers may have differed from those who participated. While we attempted to ensure that unintentional fall controls were not victims of elder abuse at the time of enrollment, it remains possible that injuries in control patients were from undetected physical elder abuse rather than unintentional fall.

Additionally, it wasn't possible to blind the investigators reviewing photographs to whether the injuries were due to physical elder abuse or unintentional fall given differences in the image format. This may have introduced bias, as reviewing authors may have had preconceived notions about the appearance of injuries in elder abuse cases.

In nearly all cases where information was available, photographs of injuries among cases was taken soon after the injury at the time of elder abuse identification or initial injury evaluation. Nevertheless, our findings about the frequency of the presence of bruising may have been impacted by differences between cases and controls in the time between the injury and photographs, given that bruising may take time to develop.

DISCUSSION

. Our approach represents a significant methodologic advance, allowing for the in-depth evaluation of injuries in a large number of legally adjudicated elder abuse cases in which the presence of abuse has been established by the criminal justice system, thus establishing a potential new “gold standard.” This represents a rich, previously unexplored data source to examine in detail characteristics of this poorly understood phenomenon. Additionally, previous research has suffered from challenges in identifying and confirming cases, with the most rigorous studies typically convening an “expert panel” to assess cases to determine that abuse occurred.^{57,68}

Our finding that the most common mechanisms were an abuser assaulting the victim with hands/fists as well as pushing/shoving them or causing a fall during altercation suggests that abuse may have been precipitated by the escalation of an argument. The mechanism of physical abuse of push/shove or fall during altercation, common among the patients within our study, may be particularly difficult to distinguish from unintentional fall.

We found that, even among successfully prosecuted cases of physical abuse, 22% did not have any visible injuries, further underscoring challenges in identification. These victims most commonly complained of pain in their chest/abdomen/back, maxillofacial/dental/neck, and upper extremities, a finding which may provide insight in how to approach patients without injury in whom abuse is suspected.

Our research suggests that injuries in physical elder abuse are commonly found in the maxillofacial/dental/neck area and the upper extremities, which confirms previous findings.^{21,59} Research comparing geriatric assault injuries to unintentional injuries has also found similar patterns, with assault injuries more commonly found on the head and face.⁶⁹

We found that physical abuse victims were significantly more likely than unintentional fallers to have bruising and injuries on the maxillofacial/dental/neck region and were less likely to have abrasions, fractures, or injuries on the lower extremities. In the only other published study, to our knowledge, comparing cases of physical elder abuse to unintentional injuries, Wiglesworth and colleagues compared bruises in elder abuse victims to older adults with unintentional trauma, finding that victims of elder abuse had bruises that were more often large (>5 cm) and found on the face, lateral right arm, or posterior torso.⁵⁷

Though not described before, our finding that injuries to the head and neck without injury to other parts of the body were much more common in abuse victims may be most helpful to clinicians. Due to aging-related physiologic changes and medications, older adults may sustain visible injuries on the extremities with a minor mechanism making the absence of these injuries suspect. Additional systematic research is needed to further explore and confirm this finding, however we feel that this may become a powerful tool for clinicians to use at the bedside.

The specific anatomic sub-regions which were identified as differing between abuse victims and falls may be of most help for clinicians. We found that physical elder abuse victims were more likely to have injuries in the left face. This supports existing literature examining younger adult assault victims, which has found that left-sided facial injuries are more frequent after assault than right-sided, likely because most assailants are right-handed.^{70–72} Neck injuries were also found much more commonly in abuse, as may be expected since the neck is typically protected during a fall by the shoulders or face. This supports existing research comparing geriatric assault to unintentional injuries which found that neck injuries were 6 times more likely in assault.⁶⁹ Ear injuries occurred in assault but not in falls, replicating prior findings in child abuse injury patterns.⁷³

While we found differences in the ulnar and posterior forearm between cases and controls, they did not reach significance. This pattern has been shown in previous research⁵⁷, as it may occur when a victim attempts to defend him/herself from an abuser.^{57,74}

That injuries in the neck or ears did not occur in any of the control patients suggests that these may represent potentially highly specific injury patterns. These preliminary results suggest clinically identifiable differences may exist between physical elder abuse injuries and those from unintentional falls.

Many abuse victims refused Emergency Medical Services transport to the ED for evaluation after abuse was detected, suggesting a resistance to seeking care that highlights challenges in elder abuse detection by health providers and should be further explored.

In summary, these promising preliminary findings suggest that differences may exist between injuries from physical elder abuse and those from unintentional falls. Specifically, physical elder abuse victims were more likely to have injuries to the left cheek/zygoma, neck, or ear. Also, abuse victims were more likely to have bruising and injuries to the maxillofacial/dental/neck region, particularly combined with no upper or lower extremity injuries. These patterns may provide clinicians with a powerful tool to be able to differentiate injuries from falls and physical abuse; clarifying one of the more complicated

differentials in geriatric. Future research is needed to confirm these injury pattern findings. Ideally, research would prospectively enroll and comprehensively evaluate victims of physical elder abuse. Ultimately, an important goal of this forensic research should be using the findings to derive and validate an easy-to-use clinical prediction rule⁷⁵ to assist busy clinical providers in identifying physical elder abuse. Currently, the findings we describe may be helpful to practicing clinicians as red flags to increase concern for the possibility of physical elder abuse and recommend that providers maintain a high index of suspicion for this very dangerous and under-recognized phenomenon.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Meetings: Preliminary results were presented at the Society of Academic Emergency Medicine Annual Scientific Meeting, San Diego, May 2015 and American Geriatrics Society Annual Scientific Meeting, National Harbor, May 2015.

Clinically Meaningful Sub-Regions: Combination of Precise Anatomic Locations for Physical Elder Abuse Injury Pattern Analysis

These 98 clinically meaningful sub-regions are combinations of the XXX precise anatomic locations described by Rosen et al in their Comprehensive Classification System for Visible Intentional and Unintentional Acute Injuries:

Rosen T, Reisig C, LoFaso VM, Bloemen EM, Clark S, McCarthy TJ, Mtui EP, Flomenbaum NE, Lachs MS. Describing visible acute injuries: development of a comprehensive taxonomy for research and practice. *Inj Prev.* 23(5):340–345.

The sub-regions are shown organized within the 6 body regions (skull / brain, maxillofacial / dental / neck, chest / abdomen / back, pelvis / gluteal region, upper extremity, lower extremity) also described by Rosen et al. Notably, for sub-regions for which there are two sub-regions for left and right, we have shown as left (right) for simplicity.

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Skull / Brain**Lateral Skull – Left (Right)**

Left (Right) Temporal Region

Left (Right) Mastoid Process

Left (Right) Parietal Region

Occiput

Left Occipital Region

Right Occipital Region

Mid Occipital Region

Maxillofacial / Dental / Neck**Face**

Left Frontal Region / Forehead

Right Frontal Region / Forehead

Mid Frontal Region / Forehead

Forehead - Unspecified

Left Supra-orbit

Left Infra-orbit

Left Medial Orbit

Left Lateral Orbit

Left Globe / Eye

Left Orbit - Unspecified

Right Supra-orbit

Right Infra-orbit

Right Medial Orbit

Right Lateral Orbit

Right Globe / Eye

Right Orbit - Unspecified

Left Nasal
Right Nasal
Nasal Bridge / Septum
Nose - Unspecified
Left External Ear
Right External Ear
Left Zygoma / Cheekbone
Right Zygoma / Cheekbone
Left External Buccal
Right External Buccal
Left Mandible
Right Mandible
Supra Peri-oral
Left Upper Lip
Right Upper Lip
Middle Upper Lip
Left Lower Lip
Right Lower Lip
Middle Lower Lip
Infra Peri-oral
Peri-oral / Lips - Unspecified
Left Mental / Chin
Right Mental / Chin
Mid Mental / Chin
Mental / Chin - Unspecified
Upper Lip

Lower Lip

Lateral Face – Left (Right)

Left (Right) Frontal Region / Forehead

Left (Right) Supra-orbit

Left (Right) Infra-orbit

Left (Right) Medial Orbit

Left (Right) Lateral Orbit

Left (Right) Globe / Eye

Left (Right) Nasal

Left (Right) External Ear

Left (Right) Zygoma / Cheekbone

Left (Right) External Buccal

Left (Right) Mandible

Left (Right) Upper Lip

Left (Right) Lower Lip

Left (Right) Mental / Chin

Left (Right) Orbit - Unspecified

Midline Face

Mid Frontal Region / Forehead

Nasal Bridge / Septum

Middle Upper Lip

Middle Lower Lip

Mid Mental / Chin

Forehead

Left Frontal Region / Forehead

Right Frontal Region / Forehead

Mid Frontal Region / Forehead

Forehead - Unspecified

Peri-orbit/orbit – Left (Right)

Left (Right) Supra-orbit

Left (Right) Infra-orbit

Left (Right) Medial Orbit

Left (Right) Lateral Orbit

Left (Right) Globe / Eye

Left (Right) Orbit - Unspecified

Peri-orbit/orbit/zygoma – Left (Right)

Left (Right) Supra-orbit

Left (Right) Infra-orbit

Left (Right) Medial Orbit

Left (Right) Lateral Orbit

Left (Right) Globe / Eye

Left (Right) Zygoma / Cheekbone

Left (Right) Orbit - Unspecified

Ears

Left External Ear

Right External Ear

Nose

Left Nasal

Right Nasal

Nasal Bridge / Septum

Nose – Unspecified

Buccal/Zygoma - Left (Right)

Left (Right) Zygoma / Cheekbone

Left (Right) External Buccal

Buccal/Mandible - Left (Right)

Left (Right) External Buccal

Left (Right) Mandible

Perioral/Oral

Supra Peri-oral

Left Upper Lip

Right Upper Lip

Middle Upper Lip

Left Lower Lip

Right Lower Lip

Middle Lower Lip

Infra Peri-oral

Peri-oral / Lips - Unspecified

Upper Lip

Lower Lip

Midline Perioral/Oral

Middle Upper Lip

Middle Lower Lip

Jaw

Left Mandible

Right Mandible

Left Mental / Chin

Right Mental / Chin

Mid Mental / Chin

Mental / Chin - Unspecified

Chin

Left Mental / Chin

Right Mental / Chin

Mid Mental / Chin

Mental / Chin - Unspecified

Neck

Anterior Neck

Left Lateral Neck

Right Lateral Neck

Cervical Spine / Midline Posterior Neck

Neck – Unspecified

Chest / Abdomen / Back

Chest / Thorax

Left Supraclavicular

Right Supraclavicular

Left Clavicular

Right Clavicular

Left Pectoral / Anterior Thorax

Right Pectoral / Anterior Thorax

Sternal

Left Breast

Left Areola

Left Nipple

Right Breast

Right Areola

Right Nipple

Left Axilla

Left Lateral Thorax / Infra-Axillary Region

Right Axilla

Right Lateral Thorax / Infra-Axillary Region

Chest / Anterior Thorax - Unspecified

Anterolateral Chest – Left (Right)

Left (Right) Supraclavicular

Left (Right) Clavicular

Left (Right) Pectoral / Anterior Thorax

Left (Right) Breast

Left (Right) Areola

Left (Right) Nipple

Left (Right) Axilla

Left (Right) Lateral Thorax / Infra-Axillary
Region

Abdomen

Left Upper Quadrant

Right Upper Quadrant

Left Lower Quadrant

Right Lower Quadrant

Periumbilical

Left Inguinal

Right Inguinal

Abdomen - Unspecified

Abdomen – Left (Right)

Left (Right) Upper Quadrant

Left (Right) Lower Quadrant

Left (Right) Inguinal

Back

Left Scapular Region

Right Scapular Region
Thoracic Spine
Left Paraspinal Thoracic
Right Paraspinal Thoracic
Thoracic Back - Unspecified
Lumbar Spine
Left Paraspinal Lumbar
Right Paraspinal Lumbar
Left Lumbar Back
Right Lumbar Back
Lumbar Back – Unspecified
Back - Unspecified

Back – Left (Right)

Left (Right) Scapular Region
Left (Right) Paraspinal Thoracic
Left (Right) Paraspinal Lumbar
Left (Right) Lumbar Back

Thoracic Back – Left (Right)

Left (Right) Scapular Region
Left (Right) Paraspinal Thoracic

Lumbar Back – Left (Right)

Left (Right) Paraspinal Lumbar
Left (Right) Lumbar Back

Pelvis / Gluteal Region**Anterior Pelvis**

Pubic symphysis
Vulvar

Vaginal

Penile

Posterior Pelvis

Sacral

Coccygeal

Left Gluteal

Right Gluteal

Upper Extremity

Upper Extremity – Left (Right)

Left (Right) Anterior Shoulder

Left (Right) Lateral Shoulder

Left (Right) Posterior Shoulder

Left (Right) Anterior Arm

Left (Right) Lateral Arm

Left (Right) Medial Arm

Left (Right) Posterior Arm

Left (Right) Anterior / Antecubital Elbow

Left (Right) Posterior / Olecranon Elbow

Left (Right) Anterior Forearm

Left (Right) Radial / Lateral Forearm

Left (Right) Ulnar / Medial Forearm

Left (Right) Posterior Forearm

Left (Right) Volar Wrist

Left (Right) Radial / Lateral Wrist

Left (Right) Ulnar / Medial Wrist

Left (Right) Dorsal Wrist

Left (Right) Thenar Eminence

Left (Right) Hypothenar Eminance
Left (Right) Mid-Palmar Hand
Left (Right) Lateral Hand
Left (Right) Medial Hand
Left (Right) Dorsal Hand
Left (Right) Palmar Surface of Thumb
Left (Right) Lateral Surface of Thumb
Left (Right) Medial Surface of Thumb
Left (Right) Dorsal Surface of Thumb
Left (Right) Palmar Surface of Finger(s)
Left (Right) Lateral Surface of Finger(s)
Left (Right) Medial Surface of Finger(s)
Left (Right) Dorsal Surface of Finger(s)
Left (Right) Hand - Unspecified
Left (Right) Shoulder – Unspecified
Left (Right) Elbow – Unspecified
Left (Right) Forearm - Unspecified
Left (Right) Wrist - Unspecified
Left (Right) Arm - Unspecified
Left (Right) Palmar Hand

Upper Extremity without Hand

Right Anterior Shoulder
Right Lateral Shoulder
Right Posterior Shoulder
Right Anterior Arm
Right Lateral Arm
Right Medial Arm

Right Posterior Arm
Right Anterior / Antecubital Elbow
Right Posterior / Olecranon Elbow
Right Anterior Forearm
Right Radial / Lateral Forearm
Right Ulnar / Medial Forearm
Right Posterior Forearm
Right Volar Wrist
Right Radial / Lateral Wrist
Right Ulnar / Medial Wrist
Right Dorsal Wrist
Right Shoulder – Unspecified
Right Elbow – Unspecified
Right Forearm - Unspecified
Right Wrist - Unspecified
Left Anterior Shoulder
Left Lateral Shoulder
Left Posterior Shoulder
Left Anterior Arm
Left Lateral Arm
Left Medial Arm
Left Posterior Arm
Left Anterior / Antecubital Elbow
Left Posterior / Olecranon Elbow
Left Anterior Forearm
Left Radial / Lateral Forearm

Left Ulnar / Medial Forearm

Left Posterior Forearm

Left Volar Wrist

Left Radial / Lateral Wrist

Left Ulnar / Medial Wrist

Left Dorsal Wrist

Left Shoulder – Unspecified

Left Elbow – Unspecified

Left Forearm - Unspecified

Left Wrist – Unspecified

Upper Extremity without Hand – Left (Right)

Left (Right) Anterior Shoulder

Left (Right) Lateral Shoulder

Left (Right) Posterior Shoulder

Left (Right) Anterior Arm

Left (Right) Lateral Arm

Left (Right) Medial Arm

Left (Right) Posterior Arm

Left (Right) Anterior / Antecubital Elbow

Left (Right) Posterior / Olecranon Elbow

Left (Right) Anterior Forearm

Left (Right) Radial / Lateral Forearm

Left (Right) Ulnar / Medial Forearm

Left (Right) Posterior Forearm

Left (Right) Volar Wrist

Left (Right) Radial / Lateral Wrist

Left (Right) Ulnar / Medial Wrist

Left (Right) Dorsal Wrist
Left (Right) Shoulder – Unspecified
Left (Right) Elbow – Unspecified
Left (Right) Forearm - Unspecified
Left (Right) Wrist - Unspecified

Upper Arm

Right Anterior Shoulder
Right Lateral Shoulder
Right Posterior Shoulder
Right Anterior Arm
Right Lateral Arm
Right Medial Arm
Right Posterior Arm
Right Anterior / Antecubital Elbow
Right Posterior / Olecranon Elbow
Left Anterior Shoulder
Left Lateral Shoulder
Left Posterior Shoulder
Left Anterior Arm
Left Lateral Arm
Left Medial Arm
Left Posterior Arm
Left Anterior / Antecubital Elbow
Left Posterior / Olecranon Elbow
Right Shoulder – Unspecified
Right Elbow – Unspecified
Left Shoulder – Unspecified

Left Elbow – Unspecified

Upper Arm – Left (Right)

Left (Right) Anterior Shoulder

Left (Right) Lateral Shoulder

Left (Right) Posterior Shoulder

Left (Right) Anterior Arm

Left (Right) Lateral Arm

Left (Right) Medial Arm

Left (Right) Posterior Arm

Left (Right) Anterior / Antecubital Elbow

Left (Right) Posterior / Olecranon Elbow

Left (Right) Shoulder – Unspecified

Left (Right) Elbow – Unspecified

Lower Arm without Hand

Right Anterior / Antecubital Elbow

Right Posterior / Olecranon Elbow

Right Anterior Forearm

Right Radial / Lateral Forearm

Right Ulnar / Medial Forearm

Right Posterior Forearm

Right Volar Wrist

Right Radial / Lateral Wrist

Right Ulnar / Medial Wrist

Right Dorsal Wrist

Left Anterior / Antecubital Elbow

Left Posterior / Olecranon Elbow

Left Anterior Forearm

Left Radial / Lateral Forearm

Left Ulnar / Medial Forearm

Left Posterior Forearm

Left Volar Wrist

Left Radial / Lateral Wrist

Left Ulnar / Medial Wrist

Left Dorsal Wrist

Right Elbow – Unspecified

Right Forearm - Unspecified

Right Wrist - Unspecified

Left Elbow – Unspecified

Left Forearm - Unspecified

Left Wrist - Unspecified

Lower Extremity

Lower Arm without Hand – Left (Right)

Left (Right) Anterior / Antecubital Elbow

Left (Right) Posterior / Olecranon Elbow

Left (Right) Anterior Forearm

Left (Right) Radial / Lateral Forearm

Left (Right) Ulnar / Medial Forearm

Left (Right) Posterior Forearm

Left (Right) Volar Wrist

Left (Right) Radial / Lateral Wrist

Left (Right) Ulnar / Medial Wrist

Left (Right) Dorsal Wrist

Left (Right) Elbow – Unspecified

Left (Right) Forearm - Unspecified

Left (Right) Wrist – Unspecified

Shoulder

Right Anterior Shoulder

Right Lateral Shoulder

Right Posterior Shoulder

Left Anterior Shoulder

Left Lateral Shoulder

Left Posterior Shoulder

Left Shoulder – Unspecified

Right Shoulder – Unspecified

Shoulder – Left (Right)

Left (Right) Anterior Shoulder

Left (Right) Lateral Shoulder

Left (Right) Posterior Shoulder

Left (Right) Left Shoulder – Unspecified

Upper Arm (excluding shoulder or elbow)

Right Anterior Arm

Right Lateral Arm

Right Medial Arm

Right Posterior Arm

Left Anterior Arm

Left Lateral Arm

Left Medial Arm

Left Posterior Arm

Upper Arm (excluding shoulder, elbow) – Left (Right)

Left (Right) Anterior Arm

Left (Right) Lateral Arm

Left (Right) Medial Arm

Left (Right) Posterior Arm

Elbow

Right Anterior / Antecubital Elbow

Right Posterior / Olecranon Elbow

Left Anterior / Antecubital Elbow

Left Posterior / Olecranon Elbow

Left Elbow – Unspecified

Right Elbow – Unspecified

Elbow – Left (Right)

Left (Right) Anterior / Antecubital Elbow

Left (Right) Posterior / Olecranon Elbow

Left (Right) Elbow – Unspecified

Forearm

Right Anterior Forearm

Right Radial / Lateral Forearm

Right Ulnar / Medial Forearm

Right Posterior Forearm

Left Anterior Forearm

Left Radial / Lateral Forearm

Left Ulnar / Medial Forearm

Left Posterior Forearm

Left Forearm - Unspecified

Right Forearm – Unspecified

Forearm – Left (Right)

Left (Right) Anterior Forearm

Left (Right) Radial / Lateral Forearm

Left (Right) Ulnar / Medial Forearm

Left (Right) Posterior Forearm

Left (Right) Forearm - Unspecified

Ulnar / Medial / Posterior Forearm

Right Ulnar / Medial Forearm

Right Posterior Forearm

Left Ulnar / Medial Forearm

Left Posterior Forearm

Ulnar / Medial / Posterior Forearm – Left (Right)

Left (Right) Ulnar / Medial Forearm

Left (Right) Posterior Forearm

Radial / Lateral / Anterior Forearm

Right Radial / Lateral Forearm

Right Anterior Forearm

Left Radial / Lateral Forearm

Left Anterior Forearm

Radial / Lateral / Anterior Forearm – Left (Right)

Left (Right) Radial / Lateral Forearm

Left (Right) Anterior Forearm

Wrist

Right Volar Wrist

Right Radial / Lateral Wrist

Right Ulnar / Medial Wrist

Right Dorsal Wrist

Left Volar Wrist

Left Radial / Lateral Wrist

Left Ulnar / Medial Wrist

Left Dorsal Wrist

Left Wrist - Unspecified

Right Wrist - Unspecified

Wrist – Left (Right)

Left (Right) Volar Wrist

Left (Right) Radial / Lateral Wrist

Left (Right) Ulnar / Medial Wrist

Left (Right) Dorsal Wrist

Left (Right) Wrist – Unspecified

Hand

Right Thenar Eminence

Right Hypothenar Eminance

Right Mid-Palmar Hand

Right Lateral Hand

Right Medial Hand

Right Dorsal Hand

Right Palmar Surface of Thumb

Right Lateral Surface of Thumb

Right Medial Surface of Thumb

Right Dorsal Surface of Thumb

Right Palmar Surface of Finger(s)

Right Lateral Surface of Finger(s)

Right Medial Surface of Finger(s)

Right Dorsal Surface of Finger(s)

Left Thenar Eminence

Left Hypothenar Eminance

Left Mid-Palmar Hand

Left Lateral Hand
Left Medial Hand
Left Dorsal Hand
Left Palmar Surface of Thumb
Left Lateral Surface of Thumb
Left Medial Surface of Thumb
Left Dorsal Surface of Thumb
Left Palmar Surface of Finger(s)
Left Lateral Surface of Finger(s)
Left Medial Surface of Finger(s)
Left Dorsal Surface of Finger(s)
Right Hand - Unspecified
Left Hand - Unspecified
Left Palmar Hand
Right Palmar Hand

Hand – Left (Right)

Left (Right) Thenar Eminence
Left (Right) Hypothenar Eminance
Left (Right) Mid-Palmar Hand
Left (Right) Lateral Hand
Left (Right) Medial Hand
Left (Right) Dorsal Hand
Left (Right) Palmar Surface of Thumb
Left (Right) Lateral Surface of Thumb
Left (Right) Medial Surface of Thumb
Left (Right) Dorsal Surface of Thumb
Left (Right) Palmar Surface of Finger(s)

Left (Right) Lateral Surface of Finger(s)

Left (Right) Medial Surface of Finger(s)

Left (Right) Dorsal Surface of Finger(s)

Left (Right) Hand - Unspecified

Left (Right) Palmar Hand

Lower Extremity – Left (Right)

Left (Right) Anterior Thigh

Left (Right) Lateral Thigh

Left (Right) Medial Thigh

Left (Right) Posterior Thigh

Left (Right) Thigh - Unspecified

Left (Right) Anterior / Patellar Knee

Left (Right) Lateral Knee

Left (Right) Medial Knee

Left (Right) Posterior / Popliteal Knee

Left (Right) Knee – Unspecified

Left (Right) Anterior Lower Leg

Left (Right) Lateral Lower Leg

Left (Right) Medial Lower Leg

Left (Right) Posterior Lower Leg

Left (Right) Lower Leg - Unspecified

Left (Right) Anterior Ankle

Left (Right) Lateral Ankle

Left (Right) Medial Ankle

Left (Right) Posterior Ankle

Left (Right) Ankle - Unspecified

Left (Right) Dorsum of Foot

Left (Right) Lateral Foot
Left (Right) Medial Foot
Left (Right) Plantar Foot
Left (Right) Foot - Unspecified
Left (Right) Dorsal Surface of Toe(s)
Left (Right) Lateral Surface of Toe(s)
Left (Right) Medial Surface of Toe(s)
Left (Right) Plantar Surface of Toe(s)

Lower Extremity without Foot

Left Anterior Thigh
Left Lateral Thigh
Left Medial Thigh
Left Posterior Thigh
Left Thigh - Unspecified
Left Anterior / Patellar Knee
Left Lateral Knee
Left Medial Knee
Left Posterior / Popliteal Knee
Left Knee – Unspecified
Left Anterior Lower Leg
Left Lateral Lower Leg
Left Medial Lower Leg
Left Posterior Lower Leg
Left Lower Leg - Unspecified
Left Anterior Ankle
Left Lateral Ankle
Left Medial Ankle

- Left Posterior Ankle
- Left Ankle - Unspecified
- Right Anterior Thigh
- Right Lateral Thigh
- Right Medial Thigh
- Right Posterior Thigh
- Right Thigh - Unspecified
- Right Anterior / Patellar Knee
- Right Lateral Knee
- Right Medial Knee
- Right Posterior / Popliteal Knee
- Right Knee – Unspecified
- Right Anterior Lower Leg
- Right Lateral Lower Leg
- Right Medial Lower Leg
- Right Posterior Lower Leg
- Right Lower Leg - Unspecified
- Right Anterior Ankle
- Right Lateral Ankle
- Right Medial Ankle
- Right Posterior Ankle
- Right Ankle – Unspecified

Lower Extremity without Foot – Left (Right)

- Left (Right) Anterior Thigh
- Left (Right) Lateral Thigh
- Left (Right) Medial Thigh
- Left (Right) Posterior Thigh

Left (Right) Thigh - Unspecified
Left (Right) Anterior / Patellar Knee
Left (Right) Lateral Knee
Left (Right) Medial Knee
Left (Right) Posterior / Popliteal Knee
Left (Right) Knee – Unspecified
Left (Right) Anterior Lower Leg
Left (Right) Lateral Lower Leg
Left (Right) Medial Lower Leg
Left (Right) Posterior Lower Leg
Left (Right) Lower Leg - Unspecified
Left (Right) Anterior Ankle
Left (Right) Lateral Ankle
Left (Right) Medial Ankle
Left (Right) Posterior Ankle
Left (Right) Ankle - Unspecified

Upper Leg

Left Anterior Thigh
Left Lateral Thigh
Left Medial Thigh
Left Posterior Thigh
Left Thigh - Unspecified
Left Anterior / Patellar Knee
Left Lateral Knee
Left Medial Knee
Left Posterior / Popliteal Knee
Left Knee – Unspecified

Right Anterior Thigh
Right Lateral Thigh
Right Medial Thigh
Right Posterior Thigh
Right Thigh - Unspecified
Right Anterior / Patellar Knee
Right Lateral Knee
Right Medial Knee
Right Posterior / Popliteal Knee
Right Knee – Unspecified

Upper Leg – Left (Right)

Left (Right) Anterior Thigh
Left (Right) Lateral Thigh
Left (Right) Medial Thigh
Left (Right) Posterior Thigh
Left (Right) Thigh - Unspecified
Left (Right) Anterior / Patellar Knee
Left (Right) Lateral Knee
Left (Right) Medial Knee
Left (Right) Posterior / Popliteal Knee
Left (Right) Knee – Unspecified

Lower Leg without Foot

Left Anterior / Patellar Knee
Left Lateral Knee
Left Medial Knee
Left Posterior / Popliteal Knee
Left Knee – Unspecified

Left Anterior Lower Leg
Left Lateral Lower Leg
Left Medial Lower Leg
Left Posterior Lower Leg
Left Lower Leg - Unspecified
Left Anterior Ankle
Left Lateral Ankle
Left Medial Ankle
Left Posterior Ankle
Left Ankle - Unspecified
Right Anterior / Patellar Knee
Right Lateral Knee
Right Medial Knee
Right Posterior / Popliteal Knee
Right Knee – Unspecified
Right Anterior Lower Leg
Right Lateral Lower Leg
Right Medial Lower Leg
Right Posterior Lower Leg
Right Lower Leg - Unspecified
Right Anterior Ankle
Right Lateral Ankle
Right Medial Ankle
Right Posterior Ankle
Right Ankle – Unspecified

Lower Leg w/o Foot – Left (Right)

Left (Right) Anterior / Patellar Knee

Left (Right) Lateral Knee

Left (Right) Medial Knee

Left (Right) Posterior / Popliteal Knee

Left (Right) Knee – Unspecified

Left (Right) Anterior Lower Leg

Left (Right) Lateral Lower Leg

Left (Right) Medial Lower Leg

Left (Right) Posterior Lower Leg

Left (Right) Lower Leg - Unspecified

Left (Right) Anterior Ankle

Left (Right) Lateral Ankle

Left (Right) Medial Ankle

Left (Right) Posterior Ankle

Left (Right) Ankle - Unspecified

Thigh

Left Anterior Thigh

Left Lateral Thigh

Left Medial Thigh

Left Posterior Thigh

Left Thigh - Unspecified

Right Anterior Thigh

Right Lateral Thigh

Right Medial Thigh

Right Posterior Thigh

Right Thigh - Unspecified

Thigh – Left (Right)

Left (Right) Anterior Thigh

Left (Right) Lateral Thigh
Left (Right) Medial Thigh
Left (Right) Posterior Thigh
Left (Right) Thigh - Unspecified

Knee

Left Anterior / Patellar Knee
Left Lateral Knee
Left Medial Knee
Left Posterior / Popliteal Knee
Left Knee – Unspecified
Right Anterior / Patellar Knee
Right Lateral Knee
Right Medial Knee
Right Posterior / Popliteal Knee
Right Knee – Unspecified

Knee – Left (Right)

Left (Right) Anterior / Patellar Knee
Left (Right) Lateral Knee
Left (Right) Medial Knee
Left (Right) Posterior / Popliteal Knee
Left (Right) Knee – Unspecified

Lower Leg

Left Anterior Lower Leg
Left Lateral Lower Leg
Left Medial Lower Leg
Left Posterior Lower Leg
Left Lower Leg - Unspecified

Right Anterior Lower Leg
Right Lateral Lower Leg
Right Medial Lower Leg
Right Posterior Lower Leg
Right Lower Leg - Unspecified

Lower Leg – Left (Right)

Left (Right) Anterior Lower Leg
Left (Right) Lateral Lower Leg
Left (Right) Medial Lower Leg
Left (Right) Posterior Lower Leg
Left (Right) Lower Leg - Unspecified

Ankle

Left Anterior Ankle
Left Lateral Ankle
Left Medial Ankle
Left Posterior Ankle
Left Ankle - Unspecified
Right Anterior Ankle
Right Lateral Ankle
Right Medial Ankle
Right Posterior Ankle
Right Ankle - Unspecified

Ankle – Left (Right)

Left (Right) Anterior Ankle
Left (Right) Lateral Ankle
Left (Right) Medial Ankle
Left (Right) Posterior Ankle

Left (Right) Ankle – Unspecified

Foot/Toes

Left Dorsum of Foot

Left Lateral Foot

Left Medial Foot

Left Plantar Foot

Left Foot - Unspecified

Left Dorsal Surface of Toe(s)

Left Lateral Surface of Toe(s)

Left Medial Surface of Toe(s)

Left Plantar Surface of Toe(s)

Right Dorsum of Foot

Right Lateral Foot

Right Medial Foot

Right Plantar Foot

Right Foot - Unspecified

Right Dorsal Surface of Toe(s)

Right Lateral Surface of Toe(s)

Right Medial Surface of Toe(s)

Right Plantar Surface of Toe(s)

Foot/Toes – Left (Right)

Left Dorsum of Foot

Left Lateral Foot

Left Medial Foot

Left Plantar Foot

Left Foot - Unspecified

Left Dorsal Surface of Toe(s)

Left Lateral Surface of Toe(s)

Left Medial Surface of Toe(s)

Left Plantar Surface of Toe(s)

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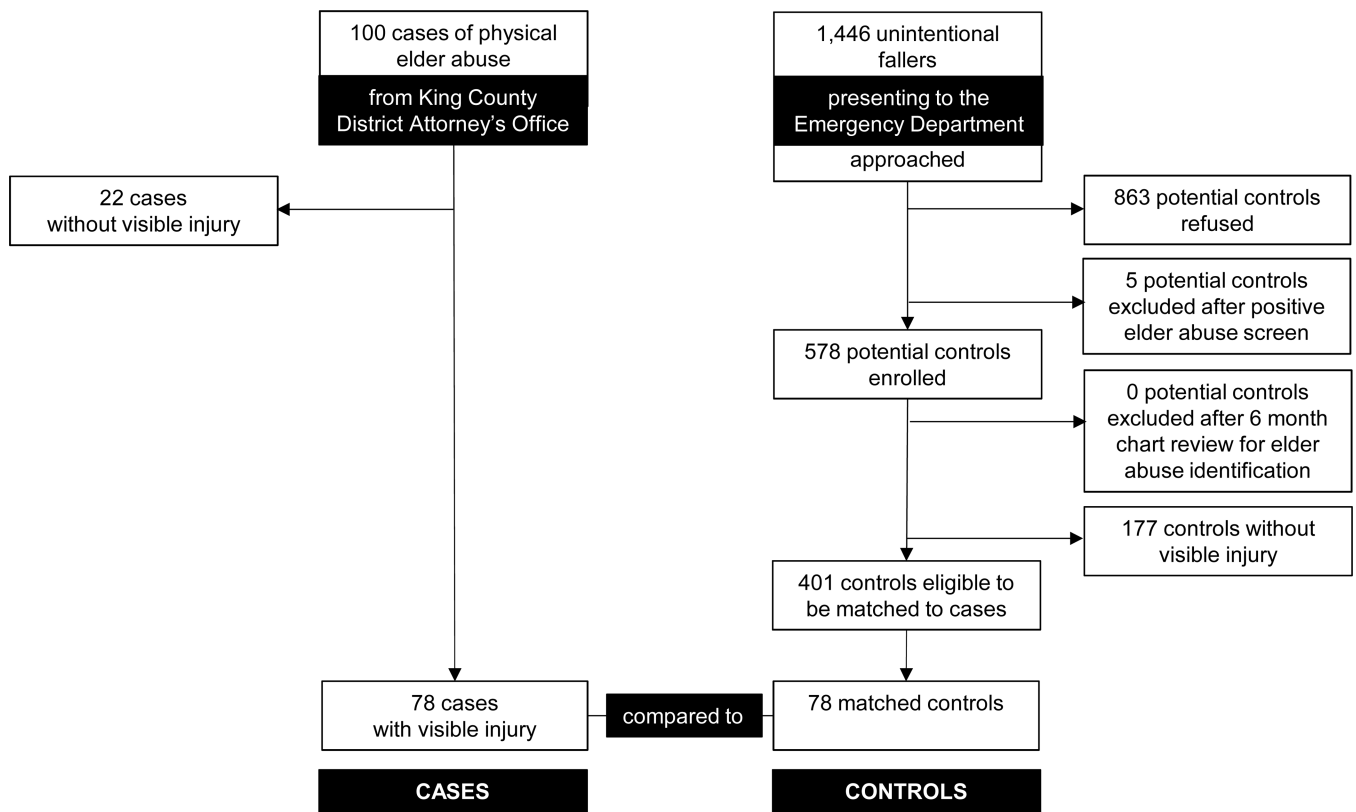


Figure 1:
Flow diagram showing sources of case and control patients

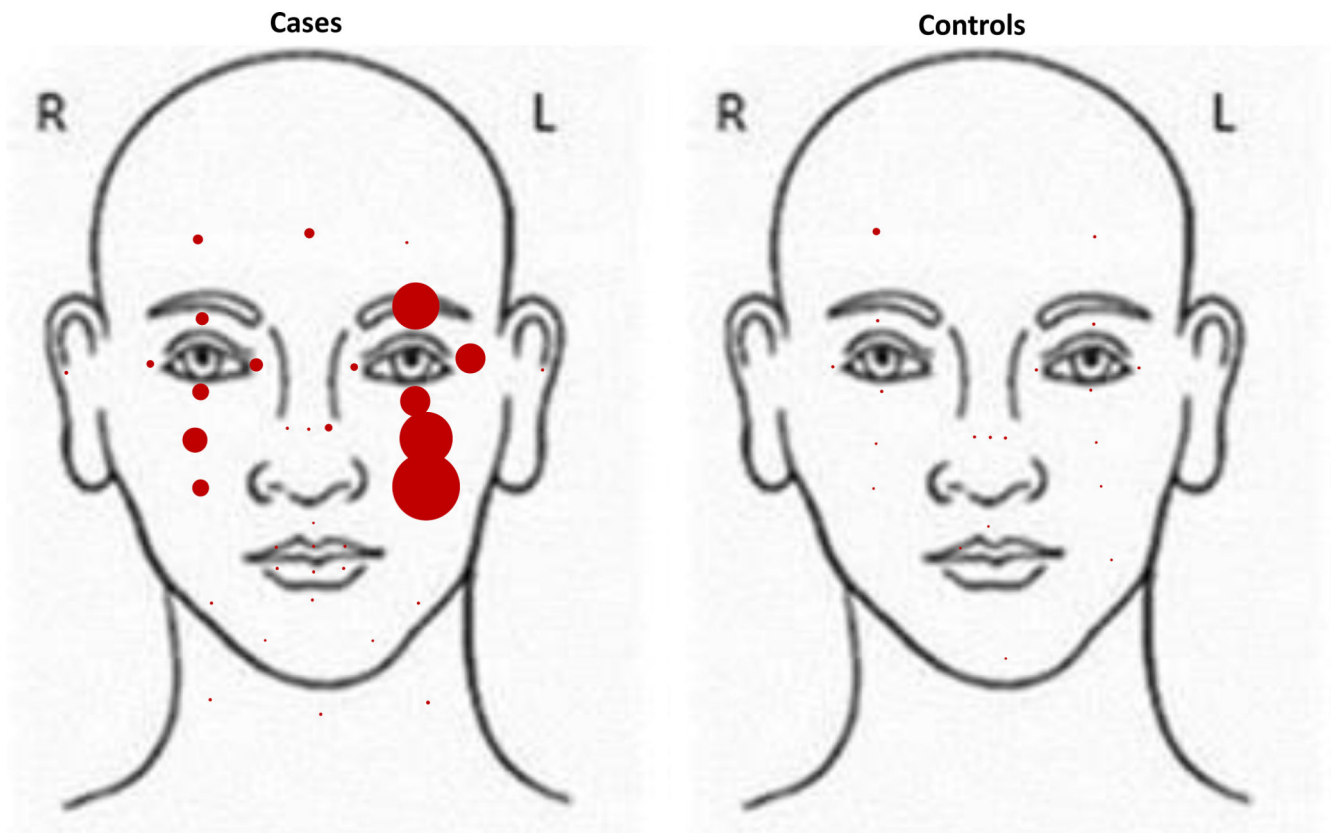


Figure 2: Comparison of precise locations of bruises in the maxillofacial/dental/neck region in physical elder abuse victims with visible injuries vs. matched unintentional fallers with visible injuries presenting to an urban, academic emergency department

Note: This figure is a visual representation of how commonly bruises were found in precise locations among case and control patients. Within the figure, we have placed a circle in each precise location where bruise(s) were found. 171 bruises in cases and 61 bruises in controls contributed to this diagram because they were in at least one precise location within the maxillofacial / dental / neck body region. For bruises that covered multiple precise locations, the diagram represents them in all of these precise locations. The size of each circle's area corresponds directly to the total number of bruises in that precise location among all case or control patients. To ensure visibility of circles, precise locations with 1–3 bruises are shown with circles with the same area.

Table 1:

Characteristics of physical elder abuse victims, abusers, and circumstances surrounding abuse

Physical Elder Abuse Cases (n=100)	
Abuser's relationship to victim	
Spouse / Companion	17
Male abuser [*]	71
Female abuser [*]	29
Former spouse / Companion	6
Male abuser ^{**}	50
Female abuser ^{**}	50
Son	41
Daughter	8
Grandchild	18
Other family	6
Home attendant	2
Other non-relative	2
Victim's living situation	
Community-dwelling with abuser	65
Community dwelling – other	33
Nursing home / group home	2
Abuser identified as victim's primary caregiver	3
Type of Physical Abuse / Mechanism ^{***}	
Blunt assault with hand/fist	62
Push/shove, fall during altercation	23
Blunt assault with object	21
Blunt assault with foot/knee	17
Strangulation/suffocation	12
Grabbing/twisting/pinching	9
Penetrating assault with object	5
Using body weight/sitting on victim	4
Other	7
Multiple Mechanisms	36
Detection Method	
Victim calls 911	58
Other person calls 911	25
Law enforcement non-911 response	6
Victim goes to police precinct to report	2
Other	9

* Percentage of Spouse / Companion abusers (total n=17)

** Percentage of Former spouse / Companion abusers (total n=6)

Percentage of victims with visible injuries (total n=78)

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Table 2:

Characteristics of injuries in physical elder abuse victims with visible injuries vs. matched unintentional fallers with visible injuries presenting to an urban, academic emergency department

	Physical Elder Abuse Cases (n=78) %	Unintentional Fall Controls (n=78) %	Difference % (95% CI)	P value
Injury Severity Score (ISS), median (IQR)	1 (1 – 2)	2 (1 – 3)	0 (0, 1.0)	0.06
Time between injury and evaluation				0.06
<1 day	92%	83%	9% (–3, 21)	
1–2 days	6%	12%	5% (–16, 5)	
>2 days	0%	5%	5% (–11, 1)	
Unknown	1%	0%	1% (–2, 5)	
Number of injuries, median (IQR)	2 (1 – 5) Range: 1 – 18	3 Range 1 – 10	0.0 (–2.0, 1.8)	0.59
Injury Type(s), frequency (95% CI)				
Bruise	78%	54%	24% (8, 41)	0.003
Abrasion	32%	46%	–14% (–31, 3)	0.08
Laceration	32%	23%	9% (–5, 23)	0.16
Fracture	8%	22%	–14% (–26, –2)	0.02
Skin tear	3%	8%	–5% (–12, 2)	0.10
Other	17%	30%	–13% (–27, 1)	0.05
Multiple injury types	47%	59%	–12% (–29, 6)	0.18
Body region(s) injured				
Maxillofacial / dental / neck	67%	28%	38% (22, 55)	<0.001
Upper extremity	40%	59%	–19% (–35, –3)	0.01
Skull / brain	22%	13%	9% (–4, 22)	0.14
Chest / abdomen / back	19%	4%	15% (4, 27)	0.005
Lower extremity	9%	41%	–32% (–45, –19)	<0.001
Pelvis / buttocks	1%	6%	–5% (–12, 2)	0.10
Multiple body regions injured	44%	41%	–3% (–14, 19)	0.74

Cases and controls were matched by age (5 year intervals), sex, and whether they lived in the community or institution.

ISS denotes injury severity score; IQR, interquartile range.

Table 3:

Sub-regions of body more commonly injured in physical elder abuse victims with visible injuries vs. matched unintentional fallers with visible injuries presenting to an urban, academic emergency department

	Physical Elder Abuse Cases (n=78) % (95% CI)	Unintentional Fall Controls (n=78) % (95% CI)	Difference % (95% CI)	P value
Maxillofacial / Dental / Neck				
Face	60%	28%	32% (15, 49)	<0.001
Left Peri-Orbital Area	22%	9%	13% (1, 25)	0.03
Left Peri-Orbital Area / Zygoma	22%	9%	13% (1, 25)	0.03
Left Cheek / Zygoma	22%	3%	19% (8, 30)	<0.001
Left Cheek / Mandible	17%	3%	14% (4, 25)	0.005
Ears	6%	0%	6% (0, 13)	0.03
Jaw	14%	3%	11% (2, 21)	0.01
Neck	15%	0%	15% (6, 25)	<0.001

Cases and controls were matched by age (5 year intervals), sex, and whether they lived in the community or institution.