

Case Report of a Needle Phobia

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Blood-injury phobia is defined in the psychiatric literature as a fear of exposure to blood, injury, pain, needles, or deformities.¹ In other phobias, exposure to the phobic cue usually causes tachycardia. In contrast, blood-injury phobia victims typically experience a diphasic cardiovascular response of an initial tachycardia, followed by bradycardia, hypotension, shock, vertigo, syncope, diaphoresis, nausea, and occasionally even coma, asystole, and death.^{1,2} The concept of needle phobia is important for health care professionals to understand, since patients fearful of needles often avoid medical and dental treatment. Here a case of severe needle phobia in an otherwise nonphobic physician and his physiological response to having blood drawn is reported.

Case Report

J.G.H. was a 39-year-old, male emergency department and family physician with extensive experience treating surgical wounds, suturing lacerations, and drawing blood. His medical history revealed, however, a lifelong involuntary fear of receiving injections or having blood drawn. He had had a strong sense of dread, with near fainting and diaphoresis, when using needles on others at the start of his medical training. His fear of others having needle procedures had been self-extinguished by first observing and then performing lancet heel sticks on neonates, and later inserting intravenous lines and drawing blood from adults. He remained very fearful of having needle procedures himself. His history revealed multiple episodes over a 19-year period of avoiding or refusing needle procedures such as having blood drawn for routine tests during physical examinations and having a scalp laceration sutured after an automobile accident.

The subject's family history was strongly positive for

needle phobia. The subject's father had an aversion to any needle procedure. Two of his father's first cousins fainted or almost fainted when they had blood drawn or received injections. The subject's mother experienced near syncope on any needle encounter. She reported an episode of fainting at the sight of an intravenous needle in a relative's foot in the hospital. She also noted that during a minor surgical procedure her pulse rate on a cardiac monitor dropped from 70 beats per minute to about 50 beats per minute on insertion of an intravenous needle. The subject's brother, an internist and emergency medicine physician, reported great anxiety and near syncope on having his blood drawn. The subject's maternal grandmother refused to have injections and instead always requested oral medication from her family physician. A maternal uncle, a family physician, reported that he experienced near syncope, diaphoresis, palpitations, and tachycardia with any needle procedure, and that his five offspring, two of whom are physicians, are all deathly afraid of having needle procedures. No other blood-injury phobias were discovered during research of the family history.

A treatment program of behavioral desensitization using a hierarchy of increasingly phobic stimuli was agreed upon, following standard exposure therapy for phobias as previously described.^{1,3-5} Initially, for an hour each day for a month, the subject practiced fantasy rehearsal imaging of sticking a needle into his forearm veins, using a broken cotton swab, an alcohol pad, and a tourniquet. He then progressed to barely breaking the epidermal surface with a 30-gauge needle, and was eventually able to insert the needle into his forearm musculature up to the needle hub. After approximately another month's practice, he was able to self-cannulate a forearm flexor vein with a small butterfly needle long enough to withdraw a 10-mL sample of blood.

After 3 months of treatment, the subject was able to agree to having blood drawn from the antecubital fossa. Before venipuncture, while attached to a cardiac monitor, his heart maintained a rate of 98 beats per minute with a prominent sinus arrhythmia for over 1 hour. His

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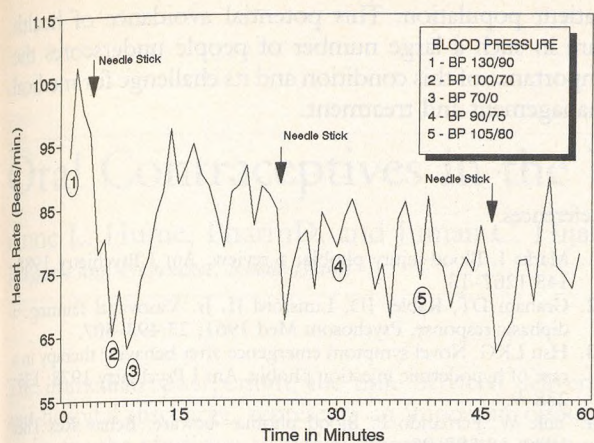


Figure 1. Cardiovascular response to venipuncture in a patient with needle phobia. Heart rate and blood pressure plunge with needle insertions, as is evident in this computer-generated graph.

blood pressure remained at his normal 130/90 mm Hg. Immediately upon needle insertion, he experienced severe anxiety, near syncope, pallor, and diaphoresis. His blood pressure plunged to a low of 70/0 mm Hg, and his pulse rate fell to a low of 63 beats per minute. As illustrated in Figure 1, the pulse rate dropped markedly during each of the three venipunctures in this session. Also, computer analysis revealed that each pulse rate drop with venipuncture coincided with a loss of the sinus arrhythmia otherwise present throughout the experiment. A moderate decrease in pulse to approximately 70 beats per minute persisted for over 3 hours after venipuncture. Although the catechol (epinephrine and norepinephrine) levels were well within normal range, the corticosteroid and antidiuretic hormone levels during the needle challenge were clearly elevated (Table 1).

Another blood drawing was performed for a medical examination over 1½ years after this initial experiment. On cannulation of a dorsal hand vein while recumbent,

Table 1. Stress Hormone Levels During Venipuncture in a Patient with Needle Phobia

Hormones	Subject Values	Normal Values
Antidiuretic hormone	11.80 pg/mL	0.5–1.5 pg/mL
Corticotropin releasing factor		<10.0 pg/mL
Total	4.96 pg/mL	
Free	<2.00 pg/mL	
Corticotropin	6.3 pmol/L	0.4–2.4 pmol/L*
Cortisol	673 nmol/L	83–359 nmol/L*
Norepinephrine	170.00 pg/mL	200–500.0 pg/mL
Epinephrine	37.00 pg/mL	10–90.0 pg/mL
Dopamine	29.00 pg/mL	10–35.0 pg/mL
β-Endorphin	6.15 pmol/L	5–25 pmol/L

*Normal afternoon levels.

J.G.H.'s blood pressure immediately fell from his baseline to 84/56 mm Hg, and his pulse slowed to 58 beats per minute.

Discussion

These data are consistent with an unconditioned physiological response to an isolated needle phobia. The cardiovascular response of bradycardia and hypotension, often termed vasomotor, vasodepressor, or vasovagal syncope, was dramatically sudden in this subject, with an onset directly coincident with needle insertion. The bradycardic response was particularly evident in that not only did the subject respond with bradycardia during each of the three blood withdrawals, he also partially responded on occasions when taking another blood sample was even discussed. Furthermore, as was evidenced during a later blood drawing, this reflex persisted even after 1½ years and after extensive treatment. J.G.H.'s sinus arrhythmia is interesting in light of a previous report of sinus arrhythmia with bradycardia among subjects exposed to emotional stimuli.⁶ Whether those with needle phobia usually experience sinus arrhythmia with needle challenge is unknown.

The subject's unremarkable epinephrine and norepinephrine response is in line with similar findings during blood testing in another victim of vasomotor syncope.⁷ On the other hand, his cortisol response was high, compared with that of several other previously reported subjects with fear of needles.⁸ The normal values for corticosteroids given in Table 1 are those for afternoon levels, the time of day during which the blood for this experiment was drawn.

The subject's dramatically high level of antidiuretic hormone (ADH), a hormone that conserves intravascular fluid volume, is logical during an episode of cardiovascular depression. The hypotension and bradycardia during blood drawing in the subject surely causes a decreased cerebral perfusion, and the pituitary, in turn, can be expected to secrete more antidiuretic hormone in response to a perceived decreased blood volume. An increased antidiuretic hormone level has previously been reported in a subject undergoing venipuncture.⁹ Interestingly, an increased level of renin, which also conserves intravascular volume, has also been reported in a vasomotor syncope victim.⁷ One can hypothesize that an exaggerated antidiuretic hormone secretion in patients with needle phobia, as in the present subject, contributes to learning the fear of needles observed in needle phobia, since intravenous antidiuretic hormone administration in experimental animals greatly enhances avoidance learn-

ing.¹⁰ Antidiuretic hormone has also been suggested as a cause of pallor and nausea in vasomotor syncope.¹¹

Previous case studies indicate a strong familial tendency in blood-injury and needle phobia.^{3,4,12} The heritability of blood-injury phobia as determined by twin studies, including fear of injections, wounds, blood, and pain, is 0.48.¹³ Therefore, although at this time a role for learned behavior is undefined, the finding in the present study of a strong personal and family medical history of isolated needle phobia, along with definitive electrocardiographic and biochemical changes, is compatible with a distinct, genetically influenced disorder.

The trait of needle phobia may have evolved among *Homo sapiens* because of its selective value in the avoidance of puncture injuries from tree limbs, shrubs, and weapons. Most violent deaths throughout human history and prehistory have been due to cutting, stabbing, and piercing injuries from axes, spears, knives, swords, and arrows. An adverse cardiovascular reflex with fainting might have been of selective value in learning to avoid previously encountered situations during which one's skin was punctured. Marks^{1,5} has suggested that bradycardia in response to blood-injury cues might have evolved in situations where immobility and fainting produced less risk of further injury than a "fight-or-flight" type of response. As with most genetic traits, multiple factors probably interacted to evolve the complex reflex underlying needle phobia.

The incidence of needle phobia among the general US population can be estimated at well over 4%¹⁴; probably over 10 million Americans suffer from needle phobia. The sample of patients usually seen in the family physician's office, however, almost surely contains a much smaller percentage of needle phobia, since those with this disorder tend to remove themselves from the

patient population. This potential avoidance of health care in such a large number of people underscores the importance of this condition and its challenge for medical management and treatment.

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