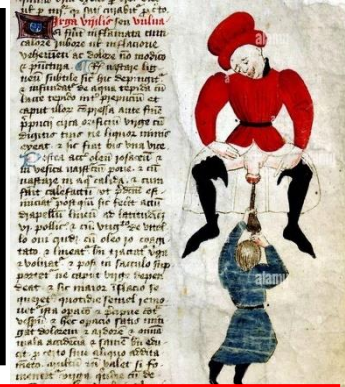


## Key:

- Red box**= Medieval medicine
- Purple box**= Renaissance and 17<sup>th</sup>/18<sup>th</sup> Century medicine
- Green box**= Industrial medicine
- Blue box**= Modern medicine

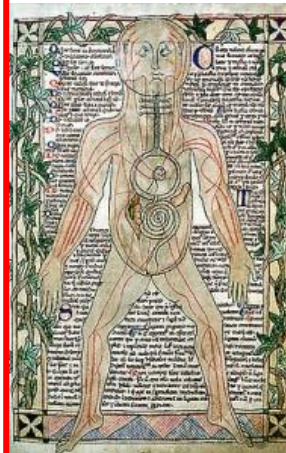


## John of Arderne (1307–1392)

- Known as the “**father of English surgery.**”
- Gained experience in the Hundred Years War, especially treating battlefield wounds.
- Wrote *The Practice of Surgery* (1350s): described his cases, gave practical instructions, and **encouraged surgeons to challenge Galen’s ideas.**
- Specialised in **anal abscesses**, a painful condition common among knights.
- John of Arderne developed a **surgical procedure** to cut away the infected tissue and drain the pus, which relieved the pressure and pain.
- He often used his **pain-relieving ointment** (opium, henbane, hemlock) to reduce suffering during and after the operation.
- His methods were **more effective than cauterisation**, which most surgeons used at the time (burning the abscess with a hot iron, often fatal or making it worse).
- Founded the Guild of Surgeons (late 1300s), helping to separate skilled surgeons from barber-surgeons and raising the status of surgery.

### Impact:

- Made some operations safer and less painful.
- Spread knowledge and improved surgical practice through his writings.

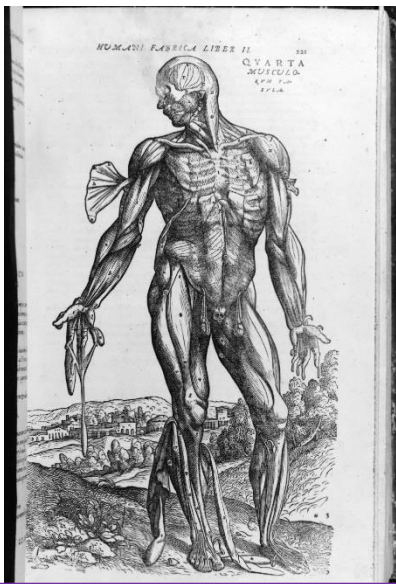


## Influence of the Church and Galen

- Dissection was **not allowed** in England, limiting surgical knowledge.
- If dissection findings disagreed with Galen, they were considered wrong.
- Universities were run by the Church – **only Church-approved works could be studied.**
- **The Church accepted Galen’s theories.**
- Galen’s work:
  - Based on animal dissection (e.g., pigs).
  - Correct: discovered the brain controls speech.
  - Mistakes:
    - Believed blood passed through “tiny holes” in the heart (**wrong**).
    - Claimed liver was the main organ providing energy (**wrong**).
    - Said the jawbone was two bones (**wrong – actually one**).
    - Said the breastbone (sternum) had seven parts (**wrong – actually three**).

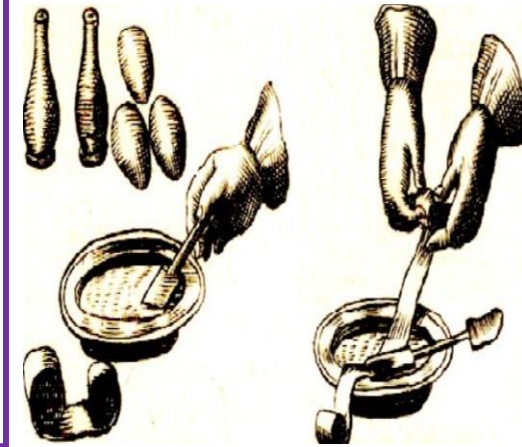
## Hugh of Lucca & son Theodoric:

- Criticised idea that pus = healing.
- Used **wine as antiseptic** – reduced infection.
- Hugh of Lucca and his son Theodoric realised that the usual way of pulling arrows out **often caused more damage**, leaving parts of the arrow behind and increasing infection.
- They developed **special surgical tools** (like arrow tongs/forceps) to carefully remove the arrowhead without tearing the flesh.
- Sometimes they would **enlarge the wound slightly** to take the arrowhead out cleanly, rather than yanking it.
- They then cleaned the wound with **wine as an antiseptic**, which lowered the risk of infection.
- Struggled for acceptance as they went against Galen.



## Changes in Surgery and Dissection

- **Religion less important** → surgeons freer to carry out **human dissections** to learn anatomy.
- **1540:** Henry VIII allowed the **Company of Barber-Surgeons** to form, regulating qualifications and donating **4 bodies a year** for dissection.
- **1745:** Parliament separated **Company of Surgeons** from barbers.
- Surgeons trained in **dissection halls** with theatres for students to watch.
- The Company later bought the **museum of John Hunter**, giving access to thousands of specimens for study.



## Andreas Vesalius (1514–1564)

**Background:** Flemish professor of anatomy at **Padua University**. Ordered **medical students to dissect bodies** themselves, rather than just watching.

**1543:** Published *The Fabric of the Human Body*.

- Included **careful, detailed drawings** of human anatomy.
- Showed **internal organs, muscles, and bones accurately**.
- Some illustrations included **instructions and guidance** useful for performing dissections and surgical procedures.

**Challenged Galen:**

- Sternum has **3 parts, not 7**.
- Jawbone is **1 bone, not 2**.
- Corrected many errors from Galen's animal-based studies.

**Consequences:**

- Some doctors resisted his ideas; Vesalius was **sacked** for challenging tradition.
- His book spread widely (translated, copied by **Thomas Geminus** in England).

**Impact:**

- Provided **accurate anatomical knowledge** for surgeons and doctors.
- Improved understanding of **how to perform dissections and some surgical procedures**.
- Laid the **foundations for modern medicine** and inspired future anatomists.

## Ambroise Paré (1510–1590)

**Background:** French army surgeon.

**Gunshot wounds:**

- Before: treated with **boiling oil** (believed to draw out poison).
- In a battle, he ran out of oil → created a mixture of **egg yolk, rose oil, turpentine**.
- Soldiers treated with this healed better, without infection or amputation.

**Stopping bleeding:**

- Reintroduced **ligatures** to tie blood vessels with silk thread, used **crow's beak clamp** and stitches.
- Less painful than cauterisation, but **risk of infection** as ligatures were unsterilised.

**Books:** Published *Works on Surgery* (1575), making his ideas widely known.

**Impact:**

- Short-term: changed treatment of **gunshot wounds**.
- Long-term: helped **shift surgery away from Galen's methods**.
- Influence spread to England by **William Clowes**, who called Paré "master surgeon."

## William Harvey (1578–1657)

**Background:** English royal doctor, studied at Padua.

**Discovery:** Proved that the **heart pumps blood around the body in a one-way system.**

### **Methods:**

- Dissected human bodies.
- Studied slow-beating hearts of cold-blooded animals.
- Used **mathematical calculations** to estimate the **volume of blood pumped by the heart** per hour/day, proving that the amount of blood passing through the body could **not be consumed and replaced** as Galen suggested.
- Pressed veins to show **valves allow blood to flow only one way.**

### **Challenged Galen:**

- Disproved Galen's idea that blood was **burnt up as fuel.**
- Undermined the theory of the **Four Humours** and treatments like bloodletting.

### **Reception:**

- Criticised, called a **"quack"**, ideas slow to be accepted.

### **Impact:**

- Immediate: limited effect on treatments (no transfusions yet).
- Long-term: laid the foundations for understanding **circulation**, which enabled **blood transfusions (1900s)** and advanced surgery.



## John Hunter (1728–1793)

**Background:** Scottish surgeon, known as the **"Father of Scientific Surgery."** Promoted surgery through a **scientific approach:** observation → hypothesis → experimentation → publication.

### **Anatomy and research:**

- Collected over **14,000 anatomical specimens** in his museum.
- Conducted experiments on animals to understand how the body worked before applying findings to humans.

### **Notable case – aneurysm:**

- Patient had a lump (aneurysm) in the knee, normally treated by amputation.
- Hunter tied off the artery supplying the lump, redirecting blood flow.
- After six weeks, the aneurysm shrank, and the patient kept the leg.

### **Surgical innovations:**

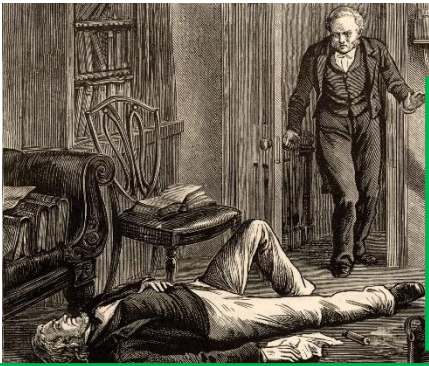
- Introduced careful **scientific observation** to surgery.
- Encouraged **practical experiments** before attempting surgery on humans.
- His methods improved success rates and reduced unnecessary amputations.

### **Teaching and influence:**

- Ran a private **anatomy school** in London.
- Trained hundreds of surgeons, spreading his scientific approach.
- His museum and writings provided a **resource for future surgical advances.**

### **Impact:**

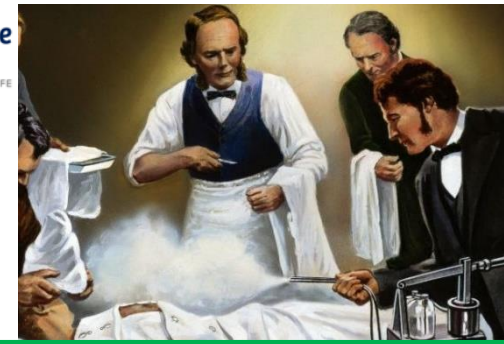
- **Raised the status of surgery** as a scientific profession.
- Laid foundations for **modern surgical practice** through experimentation and observation.
- Influenced generations of surgeons and helped establish surgery as a respected field.



## Professionalisation of Surgery

1858: General Medical Council (GMC) established.

- Ensured all surgeons were properly trained.
- Made surgery an official registered profession with recognised qualifications.



## James Simpson (1811-1870) - Anaesthetics

**Background:** Scottish obstetrician and doctor, looking for a safer, more effective anaesthetic than **ether** or **nitrous oxide**.

### Accidental discovery:

- While experimenting with chemicals, Simpson and his colleagues **inhaled chloroform** in a small, controlled session.
- They noticed it **caused unconsciousness** quickly without the violent reactions sometimes seen with ether.
- The effect was initially **unexpected**, making the discovery partly accidental.

### Testing:

- Simpson carefully **observed the effects** and experimented to find a **safe dosage**.
- Conducted tests on himself and colleagues to ensure it was **practical and controlled** for surgical use.
- Published results and promoted its use to surgeons.

### Impact on surgery:

- Allowed **longer and more complex operations** that were previously too painful.
- Made surgery **more humane**, reducing suffering and trauma for patients.
- Helped **increase public and professional acceptance** of anaesthesia after **Queen Victoria used it during childbirth**, making it socially acceptable.
- Gave surgeons the confidence to attempt more advanced procedures, **laying the groundwork for modern surgery**.

### Problems:

- Anaesthesia alone did **not reduce surgical deaths**. Infection and blood loss were still major risks until antiseptic methods (Lister) were developed.

## Joseph Lister (1827-1912) - Antiseptics

**Application of Germ Theory:** Used Louis Pasteur's work to develop methods to **prevent infection in surgery**.

### Antiseptic techniques:

- Soaked **hands, instruments, and dressings in carbolic acid**.
- Example: treated a boy's **leg fracture** that would normally require amputation. Bones were set, wrapped in **carbolic acid bandages**, and healed in **6 weeks**.
- Mortality rates in his surgeries dropped from **46% to 15%**.

### Development of aseptic surgery:

- Later methods focused on **excluding germs from the start**: sterilised instruments, protective clothing, and clean surgical environments.

### Impact:

- Revolutionised surgical safety by **preventing infections**.
- Influenced surgeons worldwide.
- Foundation for **modern aseptic techniques** in operating theatres.

**Support:** British doctor **William Roberts** linked Robert Koch's germ research to practical surgery, reinforcing Lister's methods.

## Advances from War (WW1-WW2)

### Plastic and Reconstructive Surgery

- **Harold Gillies:**
  - Developed techniques for **repairing severe facial injuries**.
  - Set up a **special graft unit** for transplants, skin treatments, and severe facial wounds.
  - First surgeon to **consider appearance** as well as function → foundation of modern **plastic surgery**.
- **Archibald McIndoe:**
  - Built on Gillies' work.
  - Used **penicillin to prevent infection** when treating pilots' facial injuries and reconstructing hands.
  - Improved survival and **recovery outcomes** for burned and injured airmen.

### Heart Surgery

- **Dwight Harken:**
  - Operated on **beating hearts**, manually removing bullets and shrapnel.
  - His work helped develop **heart surgery techniques** after the war.

### Blood Transfusions

- **Karl Landsteiner:** Discovered **blood groups**, allowing transfusions to match patient and donor.
- **Problem:** Blood clotted quickly; could not be stored.
- **Albert Hustin (1914):** Used **glucose and sodium citrate** to prevent clotting.
  - Enabled blood to be **stored and transported to front lines**.
  - Led to **National Blood Transfusion Service (1938)** → blood banks, saving many lives in WW2.

### X-Rays

- Government funded **mobile X-rays** during WW1.
- Allowed doctors to **locate bullets and shrapnel** in wounded soldiers without large surgical cuts.
- Improved **accuracy and survival rates** on the battlefield.

## Technology in surgery

### Keyhole Surgery / Endoscopy

#### How it works:

- Surgeons make **3-4 small incisions** instead of a large cut.
- **Miniature instruments** are inserted through these incisions.
- An **endoscope** (thin tube with a light and camera) provides **real-time images** of the internal area on a monitor.
- Surgeons manipulate instruments using the magnified images.

#### Benefits:

- Minimally invasive → smaller scars, less pain.
- Quicker recovery and shorter hospital stays.
- Reduced risk of infection compared to traditional open surgery.

### Laser Surgery

#### How it works:

- Uses **focused beams of light** to cut or destroy tissue.
- Lasers can **vaporise or coagulate** tissue precisely.
- Used on skin, eyes, arteries, or internal organs.

#### Benefits:

- Precise treatment → less damage to surrounding tissue.
- Can **stop bleeding**, remove ulcers, or clear blocked arteries.
- Common in cataract removal and skin treatments.

### Radiation Therapy

#### How it works:

- High-energy **X-rays or radioactive isotopes** target cancer cells.
- **Radioactive iodine** travels in the bloodstream, killing cancer cells in specific organs (e.g., thyroid) without major surgery.

#### Benefits:

- Shrinks or destroys tumours without invasive procedures.
- Can reduce the need for risky surgery.
- Often combined with surgery or chemotherapy for better outcomes.